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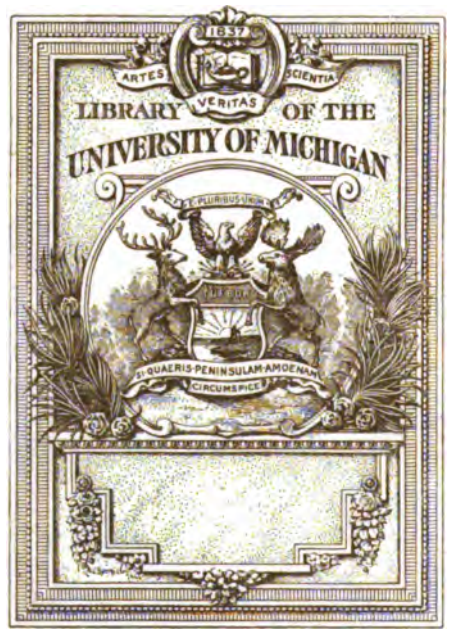
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TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION,

ORGANIZED JULY 26, 1865. INCORPORATED DEC. 1, 1894.

No. 59.

SEMI-ANNUAL MEETING.

(ATLANTA MEETING.)

HELD AT THE AUDITORIUM OF THE COTTON STATES AND INTERNATIONAL EXPOSITION, ATLANTA, GA., OCTOBER 24-25, 1895.

WALTHAM, MASS.:
PRESS OF E. L. BARRY,
1895.

ENTERED ACCORDING TO ACT OF CONGRESS
IN THE YEAR 1895
BY THE NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,
IN THE OFFICE OF THE LIBRARIAN OF CONGRESS
AT WASHINGTON.

By vote of the Board of Government, the price of the *Transactions* is $5.00 per copy for non-members, and 50 cents per copy for members for extra copies, in addition to the one to which they are entitled as a part of the privilege of membership.

CHARTER.

No. 6091.

Commonwealth of Massachusetts.

BE IT KNOWN, That whereas, EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN have associated themselves with the intention of forming a corporation under the name of the NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION, for the purpose of encouraging scientific investigation and experiment as to the methods of manufacturing cotton; collecting and imparting information relating to this industry, promoting social intercourse among its members; and establishing and maintaining a library of works on textiles in the city of Boston, and have complied with the provisions of the Statutes of this Commonwealth in such case made and provided, as appears from the certificate of the President, Treasurer and Directors of said corporation, duly approved by the Commissioner of Corporations, and recorded in this office.

Now, Therefore, I, WILLIAM M. OLIN, Secretary of the Commonwealth of Massachusetts, do hereby certify that said EDWARD W. THOMAS, C. J. H. WOODBURY, WILLIAM J. KENT, F. M. MESSENGER, HARRY T. WHITIN, ARTHUR H. LOWE, ALBERT F. KNIGHT, ALFRED M. GOODALE, FRED C. MCDUFFIE and GEORGE W. BEAN, their associates and successors, are legally organized and established as and are hereby made an existing corporation under the name of the

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,

with the powers, rights and privileges, and subject to the limitations, duties and restrictions which by law appertain thereto.

Seal of the Commonwealth of Massachusetts.

Witness my official signature hereunto subscribed, and the seal of the Commonwealth of Massachusetts hereunto affixed this first day of December, in the year of our Lord one thousand eight hundred and ninety-four.

WILLIAM M. OLIN,

Secretary of the Commonwealth.

157059

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

ORGANIZED JULY 26, 1865.

INCORPORATED DECEMBER 1, 1894.

CONSTITUTION AND BY-LAWS.

ACTIVE MEMBERS.

ARTICLE 1. Any person who is actively engaged as President, Treasurer, Agent, Superintendent or Manager in the manufacture, printing or finishing of cottons shall be eligible for active membership.

ELECTION OF MEMBERS.

ARTICLE 2. All nominations for membership shall be made in writing, at least one week before the date of any regular meeting, and shall be considered by the Board of Government, and reported to the meeting, favorably or adversely, for the action of the Association. *Provided*, that in case the Board shall decide to report adversely upon any nomination, the member who shall have made it shall be informed of the intention so to report, in order that he may have an opportunity to withdraw the name. Upon such report active members may be admitted, if they obtain a majority of votes of the members present and voting therefor, by acceptance in writing, and paying an admission fee of ten dollars, and maintaining their membership by the payment of an annual assessment not exceeding ten dollars. Any member failing to pay two successive assessments shall cease to be a member at the end of six months from the date when such second assessment shall become due. Any member may withdraw from the Association upon payment of all arrearages, first giving notice of his intention so to do, in writing, to the Secretary, and the Board of Government may accept such resignation; and any member may be expelled for cause,

at any regular meeting, two-thirds of the members present voting therefor.

ASSOCIATE MEMBERS.

ARTICLE 3. Persons engaged in the manufacture of cotton or cotton fabrics, or the manufacture of textile machinery, or industries kindred to the cotton manufacture, may become associate members of the Association. The methods of application, nomination, election and withdrawal from the Association being under the same conditions as those provided for active members in Article 2, excepting that this class of membership does not carry with it the privilege of voting or speaking, except by permission from the Board of Government or a vote of the Association to allow permission.

The initiation fee for associate members shall be twenty-five dollars, and the annual assessment shall be double the sum annually voted for active members.

Associate members may be expelled by a majority vote of the Board of Government.

HONORARY MEMBERS.

ARTICLE 4. Honorary members may be elected, when recommended by the Board of Government, at any regular meeting of the Association, who shall be enrolled as such, and shall be entitled to attend the meetings of the Association and participate in its proceedings, without the right to vote. They shall not be subject to payment of admission fees or assessments. No person actively engaged in cotton manufacture shall be eligible to honorary membership.

ARTICLE 5. It shall be the duty of all members of the Association to make returns to the Secretary of such statistics as may be called for by him, under the direction of any committee duly appointed for the collection of statistics, when not incompatible with private interests.

OFFICERS.

ARTICLE 6. The officers of this Association shall be a President, two Vice-Presidents, six Directors, a Treasurer, Secretary, and Auditor of Accounts.

ELECTION OF OFFICERS.

ARTICLE 7. At each annual meeting there shall be chosen by ballot a President, two Vice-Presidents and two Directors; the President and Vice-Presidents to serve one year, and the two Directors shall be chosen for terms of three years.

DUTIES OF OFFICERS.

ARTICLE 8. The President, or in his absence the senior Vice-President present, shall preside at all meetings of the Association and of the Board of Government. All officers shall hold their respective offices until their successors shall be chosen and accept their positions.

ARTICLE 9. The President, Vice-Presidents and Directors shall constitute a Board of Government, and have under their care and direction all matters pertaining to the management of the Association; and five of their number shall constitute a quorum for the transaction of business. Meetings of the board may be called by the President, at such time and place as he may deem expedient, giving each member a written or printed notice of the same at least five days before the day of meeting. At their first meeting the board shall elect a Treasurer, Secretary, and Auditor of Accounts for the year ensuing, and fix the amount of compensation of the Secretary. All vacancies in their board occasioned by death or resignation shall be filled by the board; and the persons so elected shall hold their offices until the next annual meeting. The board may, from time to time, as they shall deem expedient, appoint committees, from among their own board or from the members at large, to collect statistical information, examine new inventions or processes in manufacturing goods, as also to prepare essays on subjects of interest to the Association.

ARTICLE 10. The Treasurer shall keep a book in which all receipts and payments of money shall be entered, collect all moneys due the Association, and disburse the same upon the written order of the Board of Government. At the annual meeting in each year he shall make an exhibit of his accounts, or oftener if the Board of Government require it. He shall notify the members of assessments voted, and cause them to be collected in a reasonable time.

ARTICLE 11. The Secretary shall attend all meetings of the Association and of the Board of Government, and keep accurate records of

their doings. In the absence of the Secretary at any meeting, a Secretary *pro tem.* may be appointed by the presiding officer, who shall be sworn to do all things, while in office, required of the Secretary.

ARTICLE 12. The Auditor shall examine the accounts of the Treasurer annually, and report at each meeting the state of the finances.

MEETINGS.

ARTICLE 13. The annual meeting of the members of the Association shall be held on the last Wednesday of April, or at such other time, and at such hour and place as the Board of Government may appoint. There shall also be a semi-annual meeting of the Association on the last Wednesday of October, in each and every year, or at such other time, and at such place and hour as the Board of Government may appoint.

Special meetings may be called by the Board of Government whenever they deem it expedient, or upon the written application of any ten members, made to the Secretary.

ARTICLE 14. All meetings of the members of the Association shall be in pursuance of a written or printed notice, addressed to each member, with the name of the President or Secretary attached thereto, and deposited in the Post Office ten days at least before the day of meeting, specifying the time and place of meeting; and at all such meetings fifteen members shall constitute a quorum for the transaction of business.

ARTICLE 15. Amendments to the By-Laws may be made at any stated meeting of the Association by a two-thirds vote; *provided*, notice of such proposed amendment be given in writing at a previous meeting, and also notice be given to each member by the Secretary, of the pendency of such amendment, ten days at least before any such meeting.

BOARD OF GOVERNMENT.

1895.

PRESIDENT.

ALFRED M. GOODALE, 50 State Street, Boston, Mass.

VICE-PRESIDENTS.

WILLIAM J. KENT, ... New Bedford, Mass.
FRED. C. McDUFFIE, ... Boston, Mass.

DIRECTORS.

ALBERT F. KNIGHT, ... Manchester, N. H.
HENRY T. WHITIN, ... Northbridge, Mass.
ARTHUR H. LOWE, ... Fitchburg, Mass.
HERBERT L. PRATT, ... Lewiston, Me.
STEPHEN A. KNIGHT, ... Providence, R. I.
JOHN ECCLES, ... Taftville, Conn.

AUDITOR.

J. H. SAWYER, ... Boston, Mass.

SECRETARY.

C. J. H. WOODBURY, P. O. Box 3672, Boston, Mass.

OFFICERS OF THE ASSOCIATION.

FROM THE FIRST ORGANIZATION.

PRESIDENTS.

Ezekiel A. Straw,	1865–78	Henry F. Lippitt,	1888–89
Amos D. Lockwood,	1878–80	Walter E. Parker,	1889–92
John Kilburn,	1880–83	Robert McArthur,	1892–94
William C. Lovering,	1883–85	Edw. W. Thomas,	1894–95
Richard Garsed,	1885–86	A. M. GOODALE,	1895.
J. S. Ludlam,	1886–88		

VICE-PRESIDENTS.

Amos D. Lockwood,	1865–77	Walter E. Parker,	1885–89
William A. Burke,	1865–73	Richard B. Borden,	1886–88
John C. Palfrey,	1873–76	Arnold B. Sanford,	1888–91
Edward Atkinson,	1876–78	Robert McArthur,	1889–92
A. G. Cumnock,	1877–80	Simeon B. Chase,	1891–93
Charles Nourse,	1878–81	E. W. Thomas,	1892–94
William F. Goulding,	1880–83	A. M. Goodale,	1893-95
Richard Garsed,	1881–85	WILLIAM J. KENT,	1894
J. S. Ludlam,	1883–86	FRED. C. McDUFFIE,	1895

DIRECTORS.

J. S. Davis,	1865–69	A. M. Wade,	1868–69
Charles Nourse,	1865–78	D. J. Johnston,	1869–70
Phineas Adams,	1865–74	A. G. Cumnock,	1869–77
William P. Haines,	1865–69	F. E. Clarke,	1869–75
Thomas J. Borden,	1865–78	John Kilburn,	1870–80
Daniel D. Crombie,	1865–68	William P. Haines,	1874–78

DIRECTORS.—Concluded.

Cyrus I. Barker,	1875–80	Stephen N. Bourne,	1886–91
Hervey Kent,	1877–81	Robert McArthur,	1886–89
David J. Johnston,	1878–82	S. S. Spencer,	1887–90
Walter Paine, 3d,	1878–80	E. W. Thomas,	1888–92
Chas. L. Lovering,	1878–83	William H. Whitin,	1888–93
Richard Garsed,	1880–81	Robert R. Smith,	1889–92
William H. Jennings,	1880–83	Alfred M. Goodale,	1890–93
Chas. D. McDuffie,	1881–83	William J. Kent,	1891–94
Walter E. Parker,	1881–85	Herman F. Straw,	1891–93
John W. Danielson,	1881–85	Fred C. McDuffie,	1892–95
William E. Barrows,	1882–83	George W. Bean,	1892–95
Rufus A. Maxfield,	1883–86	F. M. Messenger,	1893–95
George W. Weeks,	1883–86	ALBERT F. KNIGHT,	1893
Henry S. Howe,	1883–87	HENRY T. WHITIN,	1894
Richard B. Borden,	1883–86	ARTHUR H. LOWE,	1894
O. S. Brown,	1885–91	JOHN ECCLES,	1895
Henry F. Lippitt,	1885–88	H. L. PRATT,	1895
Wilbur A. Stiles,	1886–88	STEPHEN A. KNIGHT,	1895

AUDITORS.

Benjamin Saunders,	1865–71	Henry D. Sullivan,	1873–82
John C. Palfrey,	1871–73	JACOB H. SAWYER,	1882

SECRETARY AND TREASURER.

Ambrose Eastman,	1865–94	C. J. H. WOODBURY,	1894

MEMBERS OF THE ASSOCIATION.

October 25, 1895.

Members of the Association are respectfully requested to scrutinize the following list, and advise the Secretary, P. O. Box 3672, Boston, Mass., of change in address, of any error in regard to their names; also to inform him of the decease of fellow members residing in their vicinity.

The earliest published list of membership in the Association is dated 1866, and the names in the present list of membership which occur in this first list are recorded as dating from the first meeting, July 26, 1865.

HONORARY MEMBERS.

George Arms	Grand Hotel	New York City	Oct. 16, 1872.
Ambrose Eastman	53 State St.	Boston, Mass.	Sept. 27, 1894.

ACTIVE MEMBERS.

Stephen I. Abbott,	Agt. Lockwood Co.	Waterville, Me.	Apr. 21, 1869.
Alfred E. Adams	Supt. Whitinsville Cotton Mills	Whitinsville, Mass.	Apr. 27, 1887.
Stephen L. Adams	Treas. Stafford Mfg. Co.	Central Falls, R. I.	Apr. 24, 1895.
Joseph D. Aiken	Ponemah Mills	Taftville, Conn.	Oct. 28, 1891.
F. S. Akin	Supt. Cornell Mills	Fall River, Mass.	Sept. 27, 1894.
Charles T. Aldrich	Treas. Aldrich Mfg. Co.	Providence, R. I.	Apr. 28, 1886.
George E. Ames	Mech. Supt. Lawrence Mfg. Co.	Lowell, Mass.	Apr. 24, 1895.
William Ames	Treas. Fletcher Manufg. Co.	Providence, R. I.	Apr. 30, 1879.
Charles B. Amory	Treas. Hamilton Manufg. Co.	Boston, Mass.	Apr. 25, 1894.
John W. Arrington	Treas. & Agt. Edna Cotton Mills	Reidsville, N. C.	Oct. 25, 1895.
Abel T. Atherton	Prest. A. T. Atherton Machine Co.	Pawtucket, R. I.	Oct. 16, 1872.
Edward Atkinson	Prest. Boston Mfrs. Mu. Fire Ins. Co.	Boston, Mass.	Apr. 19, 1871.
Edward W. Atkinson	Stoddard, Haserick Richards Co.	Boston, Mass.	Oct. 27, 1886.
H. C. Atwood	Treas. Williamsville Manufg. Co.	Killingly, Conn.	Apr. 29, 1885.
James A. Atwood	Agt. Wauregan Manufg. Co.	Wauregan, Conn.	Oct. 28, 1891.
John Walter Atwood	Supt. Wauregan Mills	Wauregan, Conn.	Oct. 25, 1895.
W. E. Atwood	Secy. and Treas. Williamsville Manufg. Co.	Killingly, Conn.	Sept. 27, 1894.
Geo. A. Ayer	Supt. City Manufg. Corporation	New Bedford, Mass.	Apr. 24, 1895.

Charles L. Bailey	Supt. Boston Manufg. Co.	Waltham, Mass.	Sept. 27, 1894.
Henry A. Bailey	Agt. Chicopee Manufg. Co.	Chicopee Falls, Mass.	Oct. 25, 1893.
Edwin H. Baker	Bliss, Fabyan & Co.	Box 2899, New York	Apr. 24, 1878.
Philip S. Baker	Treas. Crowders Mountain Cotton Mills	Kings Mt., N. C.	Oct. 25, 1895.
Edward Ballou		1 Hazard Ave., Prov., R. I.	Apr. 25, 1894.
William P. Bancroft	V. P. James Bancroft & Sons Co.	Wilmington, Del.	Oct. 31, 1883.
A. D. Barker	Agt. Avon Manufg. Co.	Lewiston, Me.	Apr. 19, 1871.
Lewis E. Barnes	Supt. Methuen Co.	Methuen, Mass.	Oct. 25, 1895.
W. A. Barrell	Agt. Lawrence Duck Co.	Lawrence, Mass.	Apr. 30, 1884.
Edwin N. Bartlett	Supt. Sigourney Mill	North Oxford, Mass.	Apr. 29, 1891.
Joseph P. Battles	Supt. Nonantum Worsted Co.	Newton, Mass.	Oct. 25, 1895.
George W. Bean	Agt. Androscoggin Mills	Lewiston, Me.	Apr. 17, 1872.
Truman Beckwith	Treas. Dyerville Manufg. Co.	Box 171, Prov., R. I.	Apr. 17, 1892.
William W. Blades	Supt. Crefeld Mills	Westerly, R. I.	Oct. 25, 1893.
N. B. Borden	Treas. Barnard Manufg. Co.	Fall River, Mass.	Oct. 15, 1873.
Richard B. Borden	Treas. Richard Borden Manufg. Co.	Fall River, Mass.	July 26, 1865.
Thomas J. Borden	Pres. Richard Borden Manufg. Co.	Box 18, Fall River, Mass.	July 26, 1865.
E. S. Boss	Agt. Willimantic Linen Co.	Willimantic, Conn.	Oct. 29, 1879.
Stephen N. Bourne	Agt. Stark Mills	Manchester, N. H.	Oct. 21, 1868.
Arthur F. Brackett	Supt. Riverpoint & Arctic Mills	Riverpoint, R. I.	Oct. 25, 1895.
Ernest Bridge	Supt. Jas. Chadwick & Bro. Ltd.	Jersey City, N. J.	Apr. 24, 1895.
Walter D. Brigham	Asst. Supt. Willimantic Linen Co.	Willimantic, Conn.	Apr. 24, 1895.
John W. Brown	Agt. Warren Cotton Mills	West Warren, Mass.	Oct. 25, 1895.
O. S. Brown	Agt. Salmon Falls Manufg. Co.	Salmon Falls, N. H.	Apr. 21, 1875.
E. C. Bucklin	Treas. Interlaken Mills	Providence, R. I.	Apr. 25, 1883.
Robert Burgess	140 State St.	New Bedford, Mass.	Apr. 27, 1892.
Edward N. Burke	Lowell Machine Shop	Lowell, Mass.	Apr. 29, 1880.
W. R. Burnham	Treas. Uncasville Manufg. Co.	Norwich, Conn.	Apr. 29, 1885.
William D. Cadwell	Mgr. Jackson & Nashua Companies	Nashua, N. H.	Apr. 19, 1871.
Byron F. Card	Agt. New Bedford Manufg. Co.	New Bedford, Mass.	Apr. 25, 1888.
Arnold B. Chace, Jr.	Agt. Valley Falls Co.'s Woonsocket Mill	Valley Falls, R. I.	Apr. 24, 1895.
George A. Chace	Treas. Bourne Mills	Fall River, Mass.	Apr. 25, 1877.
H. S. Chadwick	Pres. Dover Yarn Mill	Charlotte, N. C.	Apr. 24, 1895.
Chauncey C. Chase	Supt. Attawaugan Mills	Killingly, Conn.	Apr. 26, 1893.
Simeon B. Chase	Treas. King Philip Mills	Fall River, Mass.	Apr. 21, 1875.
Clarence N. Childs	Asst. Supt. Hamilton Manufg. Co.	Lowell, Mass.	Apr. 24, 1895.
Elmer G. Childs	Agt. Boston Duck Co.	Bondsville, Mass.	Oct. 26, 1892.
George A. Clark	Supt. Manchester Mills	Manchester, N. H.	Oct. 25, 1882.
Jeremiah Clark	Textile Machinery	Lowell, Mass.	Oct. 15, 1873.
J. William Clark	Clark Thread Co.	Newark, N. J.	Oct. 26, 1892.
Alfred Clarke	Eastern Electric Light and Storage Battery Co.	Lowell, Mass.	Apr. 30, 1879.

F. E. Clarke	Agt. Pemberton Co.	Lawrence, Mass.	July 26, 1865.
Alonzo A. Coburn	Whitehead Machine Co.	Lowell, Mass.	Apr. 25, 1888.
J. G. Coburn		Newton, Mass.	July 26, 1865.
John A. Collins	Supt. American Linen Co.	5 Cottage St., Fall River, Mass.	Oct. 31, 1883.
Frank B. Comins	Vice-Pres. & Gen. Mgr. Aerphor Co.	Providence, R. I.	Oct. 28, 1891.
J. J. Connell	Supt. Cohannet Mills	Taunton, Mass.	Apr. 27, 1892.
A. S. Covel	Treas. Tremont and Suffolk Mills	Boston, Mass.	Oct. 31, 1877.
A. G. Cumnock	Agt. Boott Cotton Mills	Lowell, Mass.	Oct. 28, 1885.
Andrew J. Currier	Man'gr Albion Mills	Albion, R. I.	Apr. 25, 1888.
T. B. Dallas	Treas. and Gen. Mgr. Phœnix Cotton Mills and Dallas Manufg. Co.	Nashville, Tenn. Huntsville, Ala.	Oct. 25, 1895.
Woodbury K. Dana	Treas. Banner Mill	Saccarappa, Me.	Apr. 25, 1888.
A. W. Danforth	Shanghai Cot. Cloth Mill Co. 881 Bridge St.	Shanghai, China Lowell, Mass.	Apr. 27, 1881.
A. Lockwood Danielson	Asst. Treas. Quinebaug Co.	Providence, R. I.	Sept. 27, 1894.
J. DeForest Danielson	Asst. Treas. Lockwood Co.	Providence, R. I.	Sept. 27, 1894.
John W. Danielson	Cotton Manufacturer	Box 900, Providence, R. I.	July 15, 1868.
B. D. Davol		Fall River, Mass.	Apr. 25, 1877.
James C. Deane	Supt. Griswoldville Manufg. Co.	Griswoldville, Mass.	Apr. 25, 1894.
William P. Dempsey	Agt. Dempsey Bleachery	Pawtucket, R. I.	Apr. 28, 1886.
Charles W. Dennett	Agt. Johnson Manufg. Co.	North Adams, Mass.	Oct. 29, 1890.
E. P. Dennis	Lowell Machine Shop	Lowell, Mass.	Apr. 25, 1888.
Charles A. Denny	Vice-Pres. & Gen. Mangr. American Card Clothing Co.	Leicester, Mass.	Apr. 25, 1888.
Chas. Owen Dexter	Mgr. Canadian Col'd Cot. Mills, Ltd.	Hamilton, Ont.	Apr. 24, 1895.
George Dexter	Treas. Pepperell and Laconia Cos.	Boston, Mass.	Oct. 31, 1877.
F. Dilling	Treas. Dilling Cotton Mills	Kings Mountain, N. C.	Oct. 25, 1895.
Chas. C. Diman	Treas. Whitman Mills	New Bedford, Mass.	Apr. 24, 1895.
Albert W. Dimick	Atlantic Cotton Mills	Lawrence, Mass.	Apr. 25, 1894.
Eben S. Draper	Geo. Draper & Sons	Hopedale, Mass.	Oct. 31, 1888.
George A. Draper	Geo. Draper & Sons	Hopedale, Mass.	Oct. 31, 1888.
George Otis Draper	Geo. Draper & Sons	Hopedale, Mass.	Apr. 24, 1895.
William F. Draper	Geo. Draper & Sons	Hopedale, Mass.	Jan. 17, 1867.
William F. Draper, Jr.	Geo. Draper & Sons	Hopedale, Mass.	Oct. 29, 1890.
Joseph M. Dunham	Supt. Merrick Thread Co.	Holyoke, Mass.	Oct. 26, 1892.
David H. Dyer	Quequechan Mills	Fall River, Mass.	Oct. 18, 1871.
William A. Eastman	Supt. Lowell Hosiery Co.	Lowell, Mass.	Sept. 27, 1894.
Russell W. Eaton	Agt. Cabot Manufg. Co.	Brunswick, Me.	Oct. 26, 1887.
John Eccles	Supt. Ponemah Mills	Taftville, Conn.	Apr. 27, 1892.
D. M. Ehrlich	Treas. Galveston C. and W. Mills.	Galveston, Texas	Apr. 24, 1895.
Lawrence V. Elder	Supt. Galveston C. and W. Mills	Galveston, Texas	Oct. 27, 1886.
Frederick W. Ely	Agt. Columbian Manufg. Co.	Greenville, N. H.	Apr. 25, 1888.
H. B. Estes	Agt. Continental Mills	Lewiston, Me.	Apr. 26, 1893.

C. E. Falls	Treas. Enterprise Mfg. Co.	Kings Mountain, N. C.	Oct. 25, 1895.
Herbert R. Farnum	Supt. Bernon Manufg. Co.	Georgiaville, R. I.	Apr. 27, 1881.
Clifton L. Field	Treas. Massaemit Yarn Mills	Shattuckville, Mass.	Apr. 25, 1894.
Frank S. Field	Supt. Massaemit Yarn Mills	Shattuckville, Mass.	Oct. 25, 1895.
William Firth	Mgr. Am. Drosophore Co.	Boston, Mass.	Apr. 25, 1888.
Charles H. Fish	Agt. Cocheco Manufg. Co.	Dover, N. H.	Apr. 27, 1887.
Henry E. Fisher	Agt. Atlanta Cotton Mills	Atlanta, Ga.	Oct. 25, 1895.
Herbert Fisher	Mason Machine Works	Taunton, Mass.	Oct. 29, 1879.
William B. Fittz	Supt. West Boylston Manufg. Co.	Oakdale, Mass.	Oct. 26, 1892.
Frederick A. Flather	Mech. Eng. Lowell Machine Shop	Lowell, Mass.	Apr. 29, 1891.
M. F. Foster	Denison Cotton Manufg. Co.	Milford, N. H.	Apr. 17, 1872.
Philip H. Fowler		Gloucester, N. J.	Nov. 30, 1881.
C. H. Frisbie	Agt. Attawaugan Mills	Norwich, Conn.	Oct. 29, 1890.
William Gammel J.	Agt. Berkeley Co.	Providence, R. I.	Oct. 28, 1885.
James G. Garland		Biddeford, Me.	Oct. 29, 1879.
Richard Garsed	Treas. Wingohocking Mills	Philadelphia, Pa.	Apr. 17, 1872.
James A. Gary	Pres. Gary Manufg. Co.	Baltimore, Md.	Apr. 25, 1883.
John Gegenheimer		Old Orchard, Me.	Apr. 30, 1890.
Charles E. Getchell	Supt. Waltham Bleachery	Waltham, Mass.	Oct. 30, 1889.
William C. Godfrey	Agt. Indian Orchard Mills	Indian Orchard, Mass.	Oct. 29, 1890.
Alfred M. Goodale	Treas. Boston Manufg. Co.	50 State St., Boston, Mass.	Apr. 25, 1883.
Charles J. Goodwin	Indian Orchard Mills	Indian Orchard, Mass.	Oct. 18, 1871.
Charles H. Gorton	Supt. Ballou Mill	Woonsocket, R. I.	Apr. 25, 1894.
William B. Gowdey	Mill Supplies	Providence, R. I.	Apr. 30, 1890.
George P. Grant	Treas. Green & Daniels Manufg. Co.	Pawtucket, R. I.	Sept. 27, 1894.
George P. Grant, Jr.	Treas. Grant Yarn Co.	Fitchburg, Mass.	Sept. 27, 1894.
D. W. Gray	Supt. Skenandoa Cotton Co.	Utica, N. Y.	Oct. 26, 1892.
R. A. Gray	Supt. Rodman Manufg. Co.	Allenton, R. I.	Apr. 24, 1895.
Stephen Greene	Mill Engineer	131 Devonshire St., Boston, Mass.	Oct. 27, 1886.
William C. Greene	Gen. Mgr. Peacedale Manufg. Co.	Peacedale, R. I.	Oct. 27, 1886.
John Gregson	Supt. Merchants Manufg. Co.	Fall River, Mass.	Apr. 24, 1895.
Frederick Grinnell	Pres. Gen. Fire Extinguisher Co.	Providence, R. I.	Apr. 24, 1878.
Arthur H. Gulliver	Asst. Supt. Lonsdale Co.	Ashton, R. I.	Apr. 24, 1889.
B. F. Guy	Supt. Pelzer Manufg. Co.	Pelzer, S. C.	Apr. 24, 1895.
Frank R. Hadley	Treas. Bennett Manufg. Co.	New Bedford, Mass.	Oct. 28, 1891.
Frank J. Hale	Agt. Pettee Machine Works	Newton Upper Falls, Mass.	Apr. 27, 1892.
Samuel Hale	Treas. and Agt. Portsmouth Co.	South Berwick, Me.	Oct. 29, 1890.
William E. Hall	Supt. Boston Duck Co.	Bondsville, Mass.	Apr. 27, 1892.
Z. D. Hall	Berkshire Cotton Manufg. Co.	Adams, Mass.	Oct. 29, 1879.
John H. Hambley	Treas. Quidnick Manufg. Co.	Providence, R. I.	Apr. 24, 1895.
John F. Hamlet	Supt. Manchaug Co.	Manchaug, Mass.	Oct. 31, 1888.

J. O. Hannum	Agt. Saratoga Victory Mfg. Co.	Victory Mills, N. Y.	Apr. 30, 1890.
Frank Harris	Treas. Hamlet Mills	Woonsocket, R. I.	Apr. 24, 1889.
Henry F. Harris	Treas. West Boylston Manufg. Co.	Box 282, Worcester, Mass.	Apr. 30, 1890.
John J. Hart	Supt. Merrimack Print Works	Lowell, Mass.	Apr. 24, 1895.
Frank Haskell	Agt. and Treas. Westbrook Manufg. Co.	Westbrook, Me.	Apr. 25, 1883.
A. M. Hathaway	Supt. H. N. Slater Mills	Webster, Mass.	Sept. 27, 1894.
William Hathaway	Supt. Barnard Manufg. Co.	Fall River, Mass.	Apr. 25, 1894.
William B. Hawes	Treas. No. Dighton Cotton Co.	Fall River, Mass.	Oct. 25, 1895.
Alfred Hawkesworth	Merchants Manufg. Co.	Montreal, P. Q.	Apr. 26, 1893.
Horace L. Hayden	Agt. Walhalla Cotton Mills	Walhalla, S. C.	Apr. 24, 1895.
William Hayes	Agt. Barker Mill	Auburn, Me.	Apr. 30, 1879.
James G. Hill	Supt. Lawrence Manufg. Co.	Lowell, Mass.	Jan. 15, 1868.
William R. Hill	Treas. Glasgow Manufg. Co.	S. Hadley Falls, Mass.	Oct. 25, 1893.
Geo. H. Hills	Treas. Davol Mills	Fall River, Mass.	Oct. 25, 1895.
John H. Hines	Agt. Queen City Cotton Co.	Burlington, Vt.	Sept. 27, 1894.
Charles H. Hobbs	Agt. Thorndike Co.	Thorndike, Mass.	Apr. 28, 1886.
John Holland		Dover, N. H.	Oct. 31, 1877.
Gideon F. Holmes	Treas. Plymouth Cordage Co.	No. Plymouth, Mass.	Oct. 30, 1889.
George W. Holt	Agt. Monohansett Manufg. Co.	Putnam, Conn.	Oct. 29, 1879.
William P. Holt	Supt. Slatersville Mills	Slatersville, R. I.	Oct. 25, 1893.
George L. Hooper	Mangr. Shaw Stocking Co.	Lowell, Mass.	Apr. 25, 1892.
John Hopkinson	Gen. Mgr. Slagden & Kuckney Woolen Mill	Stamford, Ky.	Apr. 25, 1883.
Henry S. Houghton, Jr.	Supt. Paul Whitin Manufg. Co.	Northbridge, Mass.	Apr. 24, 1895.
Elisha H. Howard	Agt. Harris Manufg. Co.	Providence, R. I.	Apr. 25, 1883.
Henry S. Howe	Lawrence & Co.	68 Chauncey St., Boston, Mass.	Oct. 31, 1877.
W. S. Hume	Tremont and Suffolk Mills	Lowell, Mass.	Oct. 29, 1890.
Arthur W. Hunking	Agt. Mass. Mills, in Georgia	Rome, Ga.	Apr. 24, 1895.
J. E. Jenckes	Treas. E. Jenckes Co.	Pawtucket, R. I.	Apr. 24, 1895.
David L. Jewell	Agt. China, Webster & Pembroke M.	Suncook, N. H.	July 26, 1865.
David S. Johnston	Cohoes Foundry & Machine Co.	Cohoes, N. Y.	Oct. 28, 1891.
W. T. Jordan	Mgr. Mountain Island Mfg. Co.	Mountain Island, N. C.	Oct. 25, 1895.
Frank E. Kaley	Treas. Morse & Kaley Mfg. Co.	Milford, N. H.	Oct. 25, 1895.
W. E. Keach	57 Harrison St.	Pawtucket, R. I.	Oct. 26, 1892.
Roland R. Kelly	Supt. Williamstown Manufg Co.	Williamstown, Mass.	Nov. 30, 1881.
Joseph H. Kendrick	Agt. American Supply Co.	Providence, R. I.	Apr. 30, 1879.
George E. Kent	Agt. Pittsfield Mills	Pittsfield, N. H.	Oct. 31, 1888.
Hervey Kent	Exeter Manufg. Co.	Exeter, N. H.	July 26, 1865.
William J. Kent	Agt. Wamsutta Mills	New Bedford, Mass.	Oct. 26, 1887.
Nathaniel B. Kerr	Supt. Grinnell Manufg. Co.	New Bedford, Mass.	Oct. 26, 1892.
John Kilburn		Belmont, Mass.	July 26, 1865.

Harry W. Kimball	Supt. Jewett City Mills	Jewett City, Conn.	Oct. 25, 1895.
John M. Kimball	Agt. Slatersville Mills	Slatersville, R. I.	Oct. 31, 1888.
Albert Knight	Supt. Quidnick Manufg. Co.	Anthony, R. I.	Apr. 25, 1895.
Albert F. Knight	Agt. Amory Manufg. Co.	Manchester, N. H.	Oct. 27, 1886.
Jesse A. Knight	Supt. Enfield Mills	Enfield, R. I.	Oct. 26, 1892.
Stephen A. Knight	Agt. Hebron Manufg. Co.	Box 820, Providence, R. I.	Oct. 21, 1868.
Walter B. Knight	Reynolds Manufg. Co.	Davisville, R. I.	Apr. 24, 1889.
Fred Lacey	Supt. Greylock Mills	North Adams, Mass.	Apr. 24, 1895.
Elliott Cowdin Lambert	Supt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 25, 1895.
Abbott F. Lawrence	Treas. Nemasket Mills	Box 125, Taunton, Mass.	Apr. 24, 1895.
Harold Lawton		Centreville, R. I.	Oct. 27, 1886.
Evan Arthur Leigh	E. A. Leigh & Co.	Boston, Mass.	Oct. 29, 1890.
J. Colby Lewis	Supt. Centreville Cotton Mills	Centreville, R. I.	Oct. 26, 1892.
Charles W. Lippitt	Prest. Social Manufg. Co.	Providence, R. I.	Oct. 30, 1878.
Henry F. Lippitt	Agt. Social Manufg. Co.	Providence, R. I.	Apr. 27, 1881.
Robert W. Lord	Agt. R. W. Lord & Co.	Kennebunk, Me.	Oct. 20, 1869.
Ernest Lovering	Agt. Lyman Mills	Holyoke, Mass.	Apr. 25, 1888.
Henry M. Lovering	Agt. Whittenton Manufg. Co.	Taunton, Mass.	Oct. 27, 1880.
William M. Lovering	Supt. Whittenton Manufg. Co.	Taunton, Mass.	Sept. 27, 1894.
Arthur H. Lowe	Treas. Parkhill Manufg. Co.	Fitchburg, Mass.	Oct. 30, 1889.
David Lowe	Asst. Supt. Parkhill Manufg. Co	Fitchburg, Mass.	Apr. 24, 1895.
J. S. Ludlam	Agt. Merrimack Manufg. Co.	Lowell, Mass.	Apr. 21, 1875.
William L. Lyall	Supt. J. & W. Lyall	540 W. 23d St., New York City	Oct. 26, 1892.
Herbert Lyman	Treas. Hadley Co.	Boston, Mass.	Oct. 25, 1895.
Otis G. Lynch	Supt. Enterprise Manufg. Co.	Augusta, Ga.	Oct. 25, 1895.
Alvin S. Lyon	Agt. Lowell Manufg. Co.	Lowell, Mass.	Apr. 26, 1882.
Jas. R. MacColl	Agt. Lorraine Manufg. Co.	Pawtucket, R. I.	Apr. 24, 1895.
Chas. L. Macomber	Agt. Nemasket Mills	Taunton, Mass.	Apr. 24, 1895.
Charles T. Main	Mill Engineer	Boston, Mass.	Oct. 28, 1885.
Charles R. Makepeace,	Mill Engineer	Providence, R. I.	Apr. 30, 1890.
Arthur B. Mann	Agt. U. S. Cotton Co.	Central Falls, R. I.	Apr. 25, 1894.
Charles H. Manning	Supt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 28, 1885.
Henry F. Mansfield	Supt. Utica Steam Cotton Mills and Mohawk Valley Cotton Mills	Utica, N. Y.	Apr. 30, 1890.
Albert G. Martin	Supt. Kincaid Manufg. Co.	Griffin, Ga.	Apr. 30, 1884.
Ira J. Martin	Supt. Bozrahville Co.	Bozrahville, Conn.	Oct. 26, 1892.
Philip A. Mathewson	Supt. Chace Mills	Box 607, Fall River, Mass.	Apr. 24, 1895.
Rufus A. Maxfield		Lowell, Mass.	Apr. 17, 1872.
Thomas Mayor	Textile Machinery	26 Abney St., Providence, R. I.	Oct. 27, 1880.
Robert McArthur	Agt. Pepperell and Laconia Cos.	Biddeford, Me.	Apr. 17, 1872.

Charles D. McDuffie	Agt. Manchester Mills	Manchester, N. H.	Apr. 21, 1869.
Fred C. McDuffie	Treas. Everett Mills and York Manufg. Co.	Boston, Mass.	Oct. 25, 1882.
William E. McGill		Philadelphia, Pa.	Apr. 27, 1892.
William G. McLoon	Supt. Boston Manufg. Co.	Waltham, Mass.	Apr. 27, 1892.
James H. McMullan	Agt. Saco Water Power Machine Co.	Biddeford, Me.	Apr. 21, 1869.
William P. McMullan	Agt. Naumkeag Steam Cotton Co.	Salem, Mass.	Sept. 27, 1894.
John Tempest Meats	Supt. Mason Machine Works	Taunton, Mass.	Apr. 27, 1887.
Charles H. Merriman, Jr.	Asst. Supt. Social Mfg. Co.	Woonsocket, R. I.	Apr. 25, 1895.
Frank M. Messenger	Agt. Grosvenor Dale Co.	No. Grosvenor Dale, Conn.	Apr. 27, 1887.
James I. Milliken	Agt. Everett Mills	Lawrence, Mass.	Oct. 26, 1892.
A. B. Mole	Mgr. Greylock Mill	No. Adams, Mass.	Apr. 24, 1895.
Edward A. Mongeon	Supt. Blackstone Manufg. Co.	Blackstone, Mass.	Apr. 24, 1895.
Fred W. Moore	Agt. Cordis Mills	Millbury, Mass.	Apr. 27, 1892.
George F. Morgan	Lowell Machine Shop	Lowell, Mass.	Oct. 28, 1891.
Albert H. Morton	Supt. Kitson Machine Co.	Lowell, Mass.	Oct. 28, 1891.
Fred S. Mosher	Supt. Henrietta Mills	Henrietta, N. C.	Oct. 25, 1895.
Oliver H. Moulton	Supt. Hamilton Manufg. Co.	Lowell, Mass.	July 26, 1865.
Joseph A. Moyes	Supt. Androscoggin Mills	Lewiston, Me.	Apr. 25, 1894.
Farquharson J. Muir	Supt. Canadian Col. Cot. Mills Co.	Hamilton, Ont., Can.	Apr. 27, 1892.
Wm. B. Munroe	Supt. Millville Manufg. Co.	Millville, N. J.	Oct. 25, 1895.
Roscius C. Newell	Supt. Palmer Mill	Three Rivers, Mass.	Oct. 25, 1895.
William G. Nichols	Supt. Glasgow Manufg. Co.	S. Hadley Falls, Mass.	Oct. 25, 1893.
Franklin Nourse	Agt. Lawrence Manufg. Co.	Lowell, Mass.	Apr. 24, 1878.
Eben H. Nutting	Agt. Hooksett Manufg. Co.	Hooksett, N. H.	Oct. 25, 1882.
S. Odenheimer	Lane Mills	New Orleans, La.	Oct. 25, 1893.
Charles K. Oliver	Treas. Columbia Mills Co.	Columbia, S. C.	Sept. 27, 1894.
Warren M. Orswell	Pres. Orswell Mills, Nockedge Mills and Lancaster Manufg. Co.	Fitchburg, Mass.	Apr. 16, 1873.
Oscar L. Owen	Mech. and Mill Eng. Whitin Machine Works	Whitinsville, Mass.	Apr. 25, 1894.
Elmer E. Page	Agt. York Manufg. Co.	Saco, Me.	Apr. 27, 1892.
Francis J. Parker	Treas. Monadnock Mills	Boston, Mass.	Jan. 15, 1868.
O. B. Parker	Supt. U. S. Cotton Co.	Central Falls, R. I.	Apr. 24, 1895.
Walter E. Parker	Agt. Pacific Mills	Lawrence, Mass.	Apr. 25, 1877.
John H. Parks	Pres. Parks Sons Mills	St. John, N. B.	Apr. 24, 1878.
John W. Pead	Supt. Merrimack Manufg. Co.	Lowell, Mass.	Apr. 26, 1893.
James R. Pearce	Supt. Fulton Cotton Spinning Co.	Atlanta, Ga.	Oct. 25, 1895.
Wm. C. Peirce	Pres. Elizabeth Mills	Providence, R. I.	Apr. 24, 1895.
William D. Pennell	Agt. Hill Manufg. Co.	Lewiston, Me.	Apr. 16, 1873.
Haven C. Perham	Treas. Kitson Machine Co.	Lowell, Mass.	Apr. 30, 1879.
Henry C. Phillips	Sutton Manufg. Co.	Wilkinsonville, Mass.	Apr. 25, 1894.
Andrew G. Pierce, Jr.	Treas. Pierce Manufg. Corp.	New Bedford, Mass.	Apr. 24, 1895.

Moses Pierce	Pres. Aspinook Co.	Jewett City, Conn.	Oct. 30, 1878.
Charles H. Plummer	Agt. Great Falls Manufg. Co.	Somersworth, N. H.	Apr. 25, 1888.
Thomas C. Powell	Treas. Slatersville Mills	Providence, R. I.	Oct. 30, 1889.
Herbert L. Pratt	Agt. Bates Manufg. Co.	Lewiston, Me.	Oct. 27, 1875.
J. E. Prest	Gen. Supt. Harmony Mills	Cohoes, N. Y.	Apr. 17, 1872.
M. W. Quinn	Agt. Hamilton Woolen Co.	Amesbury, Mass.	Oct. 27, 1886.
T. G. Ramsdell	Agt. Monument Mills	Housatonic, Mass.	Oct. 30, 1878.
M. A. Rawlinson	Supt. Tremont and Suffolk Mills	Lowell, Mass.	Apr. 24, 1895.
Robert Redford	Agt. Arlington Mills	Lawrence, Mass.	Apr. 26, 1882.
James Renfrew	Treas. Renfrew Manufg. Co.	Adams, Mass.	Oct. 18, 1871.
Roscoe C. Reynolds	Agt. Lewiston Machine Co.	Lewiston, Me.	Oct. 25, 1876.
F. H. Rice	Holbrook Mills	W. Boylston, Mass.	Apr. 29, 1880.
C. H. Richardson	Agt. Appleton Co.	Lowell, Mass.	Apr. 24, 1889.
Charles E. Riley	Textile Machinery	281 Congress St., Boston, Mass.	Apr. 25, 1888.
Charles D. Robinson	Supt. Crompton Co.	Crompton, R. I.	Sept. 27, 1894.
John K. Russell	Gen. Mgr. May's Landing Water P. Co.	Vineland, N. J.	Apr. 30, 1884.
Arnold B. Sanford	Treas. Globe Yarn Mill	Fall River, Mass.	Oct. 25, 1882.
Charles H. Savage	Supt. Manville Co.	Manville, R. I.	Apr. 26, 1893.
J. H. Sawyer	Treas. Newmarket Manufg. Co.	Boston, Mass.	July 26, 1865.
G. H. Sayward	Mgr. Standard Yarn Co.	Oswego, N. Y.	Oct. 29, 1890.
Arnold Schaer	Supt. Warren Manufg. Co.	Warren, R. I.	Apr. 24, 1895.
John Scott	Supt. Willimantic Linen Co.	Willimantic, Conn.	Oct. 29, 1879.
Frank P. Sheldon	Mill Engineer	Providence, R. I.	Apr. 25, 1894.
Thomas C. Sheldon	Agt. Fitchburg Duck Mills	Fitchburg, Mass.	Oct. 29, 1884.
George E. Sherman		Central Falls, R. I.	Apr. 27, 1881.
William F. Sherman	Agt. Atlantic Cotton Mills	Lawrence, Mass.	Apr. 15, 1874.
Charles M. Shove	Pres. Granite Mills	Fall River, Mass.	Oct. 27, 1875.
Herbert H. Shumway	B. B. & R. Knight	Providence, R. I.	Apr. 24, 1895.
Francis H. Silsbee	Supt. Pacific Mills	Lawrence, Mass.	Apr. 27, 1887.
Louis Simpson	Gen. Mgr. Montreal Cotton Co.	Valleyfield, P. Q.	Apr. 24, 1895.
Abbott E. Slade	Treas. Laurel Lake Mills	Fall River, Mass.	Oct. 25, 1893.
Arba C. Slater	Supt. Linwood Mills	Whitinsville, Mass.	Jan. 15, 1868.
Arthur T. Smith	Supt. Langley Manufg. Co.	Langley, S. C.	Oct. 25, 1895.
Joel Smith	Supt. The J. P. King Mills Supt. Aiken Manufg. Co.	Augusta, Ga. Aiken, S. C.	Oct. 25, 1895.
Robert R. Smith	Mgr. Greenwoods Co.	New Hartford, Conn.	Oct. 19, 1870.
Ellison A. Smyth	Pres. Pelzer Manufg. Co.	Pelzer, S. C.	Oct. 26, 1892.
Wm. S. Southworth	Agt. Mass. Cotton Mills	Lowell, Mass.	Oct. 31, 1888.
William T. Spear	Supt. Jackson Co.	Nashua, N. H.	Oct. 30, 1889.
S. S. Spencer	Supt. Conestoga Steam Mills	Lancaster, Pa.	Oct. 25, 1876.
Leroy Springs	Pres. Lancaster Cotton Mills	Lancaster, S. C.	Oct. 25, 1895.
George R. Stearns	Pres. Riverside Mills	Augusta, Ga.	Apr. 30, 1890.

Walter F. Stiles	Treas. Nockedge & Orswell Mills	Fitchburg, Mass.	Oct. 25, 1895.
O. W. Stites	Supt. W. C. Plunkett & Sons	Adams, Mass.	Oct. 25, 1895.
Joseph Stone	Room 949, 53 State St.	Boston, Mass.	Oct. 21, 1874.
Herman F. Straw	Agt. Amoskeag Manufg. Co.	Manchester, N. H.	Oct. 28, 1885.
W. H. Summersby	Supt. Pontiac Mill and Bleachery	Pontiac, R. I.	Oct. 25, 1893.
Albert A. Sweet	Supt. King Philip Mills	Fall River, Mass.	Apr. 24, 1895.
James O. Sweet	Agt. & Treas. Ashland Cotton Co.	Jewett City, Conn.	Apr. 28, 1886.
Edward P. Taft	Treas. Ponemah Mills	Providence, R. I.	Oct. 28, 1885.
Robert Rennie Taft	Supt. Baltic Power Co.	Baltic, Conn.	Apr. 24, 1895.
Robert W. Taft	Treas. Coventry Co.	Box 1144, Providence, R. I.	Sept. 27, 1894.
George P. Taylor	Supt. Lancaster, Mills	Clinton, Mass.	Apr. 25, 1877.
James W. Taylor	Supt. Canoe River Mills	Taunton, Mass.	Oct. 26, 1892.
Richard Thackeray	Supt. Weetamoe Mills	Fall River, Mass.	Apr. 29, 1885.
Earl A. Thissell	V. P. Central Oil Gas Stove Co.	Florence, Mass.	Oct. 30, 1878.
Ariel C. Thomas	Supt. Clinton Manufg. Co.	Woonsocket, R. I.	Oct. 31, 1888.
Charles E. Thomas	Treas. Forestdale Manufg. Co.	Woonsocket, R. I.	Oct. 31, 1883.
Edward W. Thomas	Agt. Tremont and Suffolk Mills	Lowell, Mass.	Apr. 30, 1884.
Ralph E. Thomson	Supt. Parkhill Manufg. Co.	Fitchburg, Mass.	Apr. 25, 1894.
D. M. Thompson	Pres. & Treas. Corliss Steam Engine Co.	Providence, R. I.	Oct. 28, 1885.
Osmon B. Tilton	Supt. Exposition Cotton Mills	Atlanta, Ga.	Oct. 27, 1886.
James P. Tolman	Pres. Samson Cordage Works	Boston, Mass.	Oct. 29, 1890.
D. A. Tompkins	Pres. Atherton Cotton Mills	Charlotte, N. C.	Oct. 25, 1895.
George W. Towne	Supt. Arlington Mills	Lawrence, Mass.	Oct. 26, 1892.
William E. Trainer	Prest. Linwood Mills	Trainer, Penn.	Apr. 21, 1875.
Robert B. Treat	Centerville Cotton Mill	Centerville, R. I.	Sept. 27, 1894.
Edmund E. Truesdell	Supt. China, Webs'r & Pemb'ke Mills	Suncook, N. H.	Apr. 26, 1876.
Oscar B. Truesdell	Agt. Fiskdale Mills	Fiskdale, Mass.	Apr. 24, 1895.
George E. Tucker	Agt. Otis Co.	Ware, Mass.	Oct. 25, 1895.
Frank P. Vogl	Agt. Monadnock Mills	Claremont, N. H.	Sept. 27, 1894.
Jude C. Wadleigh	Supt. Mass. Cotton Mills	Lowell, Mass.	Oct. 26, 1892.
H. E. Walmesley	Supt. Clark Thread Co.	Newark, N. J.	Oct. 29, 1890.
James A. Walsh	Agt. Lewiston Bleachery	Lewiston, Me.	Apr. 27, 1892.
James Waring	Treas. Narragansett Mills	Fall River, Mass.	Oct. 27, 1875.
John Waterman	Treas. Warren Manufg. Co.	Warren, R. I.	Apr. 30, 1884.
J. W. Wattles	Manufacturers' Supplies	Canton, Mass.	July 26, 1865.
T. B. Wattles	Mangr. Boscawen Mills	Penacook, N. H.	July 26, 1865.
George W. Weeks	Agt. Lancaster Mills	Clinton, Mass.	Apr. 21, 1869.
W. B. Smith Whaley	Prest. Richland Cotton Mills	Columbia, S. C.	Apr. 24, 1895.
H. D. Wheat	Treas. Gaffney Manufg. Co.	Gaffney, S. C.	Apr. 24, 1895.
Channing Whitaker	Mill Eng. Lowell Machine Shop	Lowell, Mass.	Oct. 15, 1873.
A. Tenny White	Supt. Globe Mill	Woonsocket, R. I.	Oct. 26, 1887.
Arthur F. Whitin	Prest. Sanders Cotton Mills Agt. Whitinsville Cotton Mills	Whitinsville, Mass	Apr. 24, 1895.

Henry T. Whitin	Treas. Paul Whitin Manufg. Co.	Northbridge, Mass.	Apr. 25, 1877.
Alfred N. Whiting	Treas. L. M. Harris Manufg. Co.	Oakdale, Mass.	Apr. 21, 1875.
William S. Whitney	Box 209	Fall River, Mass.	Apr. 24, 1878.
William Whittam, Jr.	Gen. Agt. Jas. Chadwick & Bro., Ltd.	Jersey City, N. J.	Apr. 26, 1893.
George F. Whitten	Supt. Stark Mills	Manchester, N. H.	Oct. 26, 1892.
E. B. Wilbur	Supt. Pequot Mills	Montville, Conn.	Oct. 30, 1889.
Henry M. Wilcox	Treas. John Rhodes Warp Co.	Millbury, Mass.	Apr. 24, 1889.
Theop. W. Wilmarth	Supt. Millbury Cotton Mills	Millbury, Mass.	Oct. 31, 1883.
Thomas Wilmarth	Saunders Cotton Mills	Saundersville, Mass.	Apr. 21, 1875.
J. P. Wilson	Treas. Dover Yarn Mills	Charlotte, N. C.	Oct. 25, 1895.
A. S. Winslow	Supt. Peabody Co.	Newburyport, Mass.	Oct. 31, 1888.
George Wood	Millville Manufg. Co.	Philadelphia, Pa.	Oct. 16, 1872.
C. J. H. Woodbury	Secy. and Treas.	Lynn, Mass.	Oct. 29, 1879.
Alvin Woodman	32 Wilder St.	Brockton, Mass	Apr. 26, 1893.
A. A. Young, Jr.	Treas. Jewett City Mills	Jewett City, Conn.	Sept. 27, 1894.
Adelbert R. Young	Supt. Ashland Cotton Co.	Jewett City, Conn.	Apr. 25, 1894.

ASSOCIATE MEMBERS.

Wm. Emmett Anderson	Eng. and Mgr. Standard Circular Cot. Co., Ltd.	Little Rock, Ark.	Oct. 25, 1895.
G. M. Angier	Agt. Eddy Electric Co.	64 Federal St., Boston, Mass.,	Apr. 24, 1895.
Geo. R. Babbitt	Pres. American Oil Co.	182 So. Water St., Providence, R. I.	Apr. 24, 1895.
D. C. Ball	Pres. Amer. Cot. Bale Imp'ment Co.	St. Louis, Mo.	Oct. 25, 1895.
Geo. S. Barnum	Secy. and Treas. The Bigelow Co.	New Haven, Conn.	Apr. 24, 1895.
Geo. W. Benson	Cotton Dealer	36 Purchase St., Boston, Mass.	Apr. 24, 1895.
C. H. Botsford	2d Vice-Pres. Amer. Cot. Bale Imp. Co.	Waco, Texas	Oct. 25, 1895.
J. Payson Bradley	The Kehew-Bradley Co.	Boston, Mass.	Apr. 24, 1895.
D. Russell Brown	Brown Bros. Co.	Providence, R. I.	Apr. 24, 1895.
H. Martin Brown	Brown Bros. Co.	Providence, R. I.	Apr. 24, 1895.
John H. Burghardt	Mill Supplies	Boston, Mass.	Apr. 24, 1895.
Eugene E. Burnham	Leather Belting Manufg.	Lawrence, Mass.	Oct. 25, 1895.
James Butterworth	Pres. H. W. Butterworth & Sons	Philadelphia, Pa.	Apr. 24, 1895.
Malcolm Campbell	Woonsocket Machine and Press Co.	Woonsocket, R. I.	Apr. 24, 1895.
W. W. Carey	Wood Machinery Builder	Lowell, Mass.	Apr. 24, 1895.
Fred A. Chase	Mill Supplies	Providence, R. I.	Apr. 24, 1895.
Chas. H. Child	Treas. Brown Bros. Co.	Providence, R. I.	Apr. 24, 1895.
Peter H. Corr	Cotton and Cotton Yarns	Taunton, Mass.	Apr. 24, 1895.
Thos. S. Cox	Selling Agt. Mason Mach. Works	Taunton, Mass.	Apr. 24, 1895.
Frederick I. Dana	Mech. Eng. Thomas Phillips Co.	Providence, R. I.	Apr. 25, 1895.
R. H. Deming	Cotton Merchant	Providence, R. I.	Apr. 24, 1895.
C. E. W. Dow	Agt. Metallic Roll Co.	Indian Orchard, Mass.	Apr. 24, 1895.

G. E. Emmons	Pres. Emmons Loom Harness Co.	Lawrence, Mass.	Oct. 25, 1895.
T. C. Entwistle	Cotton Machinery Builder	Lowell, Mass.	Apr. 24, 1895.
D. D. Felton	Treas. S. A. Felton & Sons Co.	Manchester, N. H.	Apr. 24, 1895.
John W. Fergurson	Mill Engineer	Paterson, N. J.	Apr. 24, 1895.
J. Herbert Foster	Cotton Broker	Providence, R. I.	Apr. 24, 1895.
Geo. A. Fuller	Pres. Stedman & Fuller Mfg. Co.	Providence, R. I.	Apr. 24, 1895.
H. P. Garland	Treas. Loom Picker Co.	Biddeford, Me.	Oct. 25, 1895.
Allan V. Garratt	Chief Eng. Lombard Water Wheel Gov. Co.	61 Hampshire St., Boston, Mass.	Apr. 24, 1895.
Royal W. Gates	Joshua Gates & Sons, Belting	Lowell, Mass.	Apr. 24, 1895.
W. S. Granger	Prest. Granger Foundry & Machine Co.,	Providence, R. I.	Apr. 24, 1895.
A. Walter Harris	Treas. A. W. Harris Oil Co.	Providence, R. I.	Oct. 25, 1895.
John H. Haworth	Haworth & Watson Mfrs. Paper Tubes for Textile Manufg.	Lowell, Mass.	Oct. 25, 1895.
Henry A. Holcomb	Treas. New Bedford Boiler Co.	New Bedford, Mass.	Oct. 25, 1895.
C. H. Hutchins	Pres. Knowles Loom Works	Worcester, Mass.	Oct. 25, 1895.
David Jackson	Mangr. Jackson Pat. Shell Roll Co.	Pawtucket, R. I.	Apr. 25, 1895.
Wm. B. Kehew	The Kehew-Bradley Co.	Boston, Mass.	Apr. 24, 1895.
Josiah M. Lasell	Asst.-Treas. Whitin Machine Works,	Whitinsville, Mass.	Apr. 24, 1895.
Stephen C. Lowe	Mill Supplies	New Bedford, Mass.	Oct. 25, 1895.
F. H. Maynard	Bus. Mgr. Gen. Fire Extinguisher Co.,	Providence, R. I.	Apr. 24, 1895.
Geo. H. Meader	Steam Appliances	165 High St., Boston, Mass.	Apr. 24, 1895.
Geo. B. Morison	Selling Agt. Hadley Co.	Boston, Mass.	Apr. 24, 1895.
Sidney B. Paine	Elec. Eng. Gen. Elec. Co.	180 Summer St., Boston, Mass.	Apr. 24, 1895.
Geo. C. Phillips	Treas. Thomas Phillips Co.	Providence, R. I.	Apr. 24, 1895.
Stephen Minot Pitman	Sec'y Narragansett Fire Ins. Co.	Providence, R. I.	Apr. 25, 1895.
Charles F. Randall	Expert in Textiles	Equitable. Bld., Boston, Mass.	Apr. 25, 1895.
R. H. Rice	Treas. Rice & Sargent Steam Eng. Co.	Providence, R. I.	Apr. 24, 1895.
C. E. Roberts	Mangr. Hartford St. Boiler Imp. & Inspection. Co.	125 Milk St., Boston, Mass.	Apr. 24, 1895.
John M. Russell	Cashier Knowles Loom Works	Worcester, Mass.	Oct. 25, 1895.
E. A. Smith	Pres. Charlotte Supply Co.	Charlotte, N. C.	Oct. 25, 1895.
Lewis R. Speare	Alden Speare Sons & Co., Oil and Mill Supplies.	Boston, Mass.	Oct. 25, 1895.
Henry C. Spence	Gen. Mgr. Metallic Drawing Roll Co.	Indian Orchard, Mass.	Apr. 24, 1895.
Geo. W. Stafford	Mgr. Knowles Loom Works	Providence, R. I.	Apr. 25, 1895.
Daniel J. Sully	Cotton Broker	Providence, R. I.	Apr. 24, 1895.

Cyrus A. Taft	Whitin Machine Works	Whitinsville, Mass.	Apr. 24, 1895.
G. A. Thudium	Victoria Size	Malden, Mass.	Apr. 24, 1895.
Wm. V. Threlfall	Selling Agt. Pettee Machine Works	Newton Upper Falls, Mass.	Apr. 24, 1895.
Justin A. Ware	Secy. and Treas. Crompton Loom Wks.	Worcester, Mass.	Oct. 25, 1895.
Walter S. Watson	Haworth & Watson Mfrs. Paper Tubes for Textile Manufg.	Lowell, Mass.	Oct. 25, 1895.
G. Marston Whitin	Treas. Whitin Machine Works	Whitinsville, Mass.	Apr. 24, 1895.
Erving Y. Woolley	Stoddard, Haserick, Richards & Co.	152 Congress St., Boston, Mass.	Apr. 24, 1895.

Honorary Members	2
Active Members	358
Associate Members	62
Total Membership	422

MEMBERS OF THE ASSOCIATION,

1895.

ARRANGED BY STATES.

MAINE.

Stephen I. Abbot	Lockwood Co.	Waterville.
A. D. Barker	Avon Manufg. Co.	Lewiston.
George W. Bean	Androscoggin Mills	Lewiston.
Woodbury K. Dana	Banner Mill	Saccarappa.
Russell W. Eaton	Cabot Manufg. Co.	Brunswick.
H. B. Estes	Continental Mills	Lewiston.
James G. Garland		Biddeford.
H. P. Garland	Loom Picker Co.	Biddeford.
John Gegenheimer		Old Orchard, Me.
Samuel Hale	Portsmouth Co.	South Berwick.
Frank Haskell	Westbrook Manufg. Co.	Saccarappa.
William Hayes	Barker Mill	Auburn.
Robert W. Lord	R. W. Lord & Co.	Kennebunk.
Robert McArthur	Pepperell and Laconia Cos.	Biddeford.
James H. McMullan	Saco Water Power Machine Co.	Biddeford.
Joseph A. Moyes	Androscoggin Mills	Lewiston.
Elmer E. Page	York Manufg. Co.	Saco.
William D. Pennell	Hill Manufg. Co.	Lewiston.
Herbert L. Pratt	Bates Manufg. Co.	Lewiston.
Roscoe C. Reynolds	Lewiston Machine Co.	Lewiston.
James A. Walsh	Lewiston Bleachery	Lewiston.

NEW HAMPSHIRE.

Stephen N. Bourne	Stark Mills	Manchester.
O. S. Brown	Salmon Falls Manufg. Co.	Salmon Falls.
William D. Cadwell	Nashua and Jackson Cos.	Nashua.
George A. Clark	Manchester Mills	Manchester.
Frederick W. Ely	Columbian Manufg. Co.	Greenville.
D. D. Felton	S. A. Felton & Sons Co.	Manchester.
Charles H. Fish	Cocheco Manufg. Co.	Dover.
M. F. Foster	Denison Cotton Manufg. Co.	Milford.
John Holland		Dover.
David L. Jewell	China, Webster & Pembroke Mills	Suncook.

Frank E. Kaley	Morse & Kaley Manufg. Co.	Milford.
George E. Kent	Pittsfield Mills	Pittsfield.
Hervey Kent	Exeter Manufg. Co.	Exeter.
Albert F. Knight	Amory Manufg. Co.	Manchester.
Elliott Cowdin Lambert	Amoskeag Manufg. Co.	Manchester.
Charles H. Manning	Amoskeag Manufg. Co.	Manchester.
Charles D. McDuffie	Manchester Mills	Manchester.
Eben H. Nutting	Hooksett Manufg. Co.	Hooksett.
Charles H. Plummer	Great Falls Manufg. Co.	Somersworth.
William T. Spear	Jackson Co.	Nashua.
Herman F. Straw	Amoskeag Manufg. Co.	Manchester.
Edmund E. Truesdell	China, Webster & Pembroke Mills	Suncook.
Frank P. Vogl	Monadnock Mills	Claremont.
T. B. Wattles	Boscawen Mills	Pennacook.
George F. Whitten	Stark Mills	Manchester.

VERMONT.

John H. Hines	Queen City Cotton Co.	Burlington.

MASSACHUSETTS.

Alfred E. Adams	Whitinsville Cotton Mills	Whitinsville.
F. S. Akin	Cornell Mills	Fall River.
George E. Ames	Lawrence Manufg. Co.	Lowell.
Charles B. Amory	Hamilton Manufg. Co.	Boston.
G. M. Angier	Eddy Electric Manufg. Co.	Boston.
Edward Atkinson	Boston Mfrs. Mutual Fire Ins. Co.	Boston.
Edward W. Atkinson	Stoddard, Haserick Richards & Co.,	Boston.
George A. Ayer	City Manufg. Corp.	New Bedford.
Charles L. Bailey	Boston Manufg. Co.	Waltham.
Henry A. Bailey	Chicopee Manufg. Co.	Chicopee Falls.
Lewis E. Barnes	Methuen Co.	Methuen.
W. A. Barrell	Lawrence Duck Co.	Lawrence.
Edwin N. Bartlett	Sigourney Mill	North Oxford.
Joseph P. Battles	Nonantum Worsted Co.	Newton.
George W. Benson	Cotton Dealer	Boston.
Nathaniel B. Borden	Barnard Manufg. Co.	Fall River.
Richard B. Borden	Richard Borden Manufg. Co.	Fall River.
Thomas J. Borden	Fall River Mutual Ins. Co.	Fall River.
J. Payson Bradley	The Kehew-Bradley Co.	Boston.
John W. Brown	Warren Cotton Mills	West Warren.
Robert Burgess	140 State St.	New Bedford.
John H. Burghardt	Mill Supplies	Boston.
Edward N. Burke	Lowell Machine Shop	Lowell.
Eugene E. Burnham	Leather Belting Mfg.	Lawrence.
Byron F. Card	New Bedford Manufg. Co.	New Bedford.

W. W. Carey	Machinery Builder	Lowell.
George A. Chace	Bourne Mills	Fall River.
Simeon B. Chase	King Philip Mills	Fall River.
Clarence N. Childs	Asst. Supt. Hamilton Manufg. Co.	Lowell.
Elmer G. Childs	Boston Duck Co.	Bondsville.
Jeremiah Clark	Textile Machinery	Lowell.
Alfred Clarke	Eastern Elec. Light & Stor. Bat. Co.	Lowell.
F. E. Clarke	Pemberton Co.	Lawrence.
Alonzo A. Coburn	Whitehead Machine Co.	Lowell.
J. G. Coburn		Newton.
John A. Collins	American Linen Co.	Fall River.
J. J. Connell	Cohannet Mills	Taunton.
Peter H. Corr	Cotton and Cotton Yarns	Taunton.
Alphonso S. Covel	Tremont and Suffolk Mills	Boston.
Thomas G. Cox	Mason Machine Works	Taunton.
A. G. Cumnock	Boott Cotton Mills	Lowell.
B. D. Davol		Fall River.
James C. Deane	Griswoldville Manufg. Co.	Griswoldville.
Chas. W. Dennett	Johnson Manufg. Co.	North Adams.
E. P. Dennis	Lowell Machine Shop	Lowell.
Charles A. Denny	American Card Clothing Co.	Leicester.
George Dexter	Pepperell and Laconia Cos.	Boston.
Chas. C. Diman	Whitman Mills	New Bedford.
Albert W. Dimick	Atlantic Cotton Mills	Lawrence.
C. E. W. Dow	Metallic Roll Co.	Indian Orchard.
Eben S. Draper	Geo. Draper & Sons	Hopedale.
George A. Draper	Geo. Draper & Sons	Hopedale.
Geo. Otis Draper	Geo. Draper & Sons	Hopedale.
William F. Draper	Geo. Draper & Sons	Hopedale.
William F. Draper, Jr.	Geo. Draper & Sons	Hopedale.
Joseph M. Dunham	Merrick Thread Co.	Holyoke.
David H. Dyer	Quequechan Mills	Fall River.
Ambrose Eastman	53 State St.	Boston.
William A. Eastman	Lowell Hosiery Co.	Lowell.
G. E. Emmons	Emmons Loom Harness Co.	Lawrence.
Clifton L. Field	Massaemit Yarn Mills	Shattuckville.
Frank S. Field	Massaemit Yarn Mills	Shattuckville.
T. C. Entwistle	Manufacturer of Cotton Mach'y	Lowell.
William Firth	Am. Drosophore Co.	Boston.
Herbert Fisher	Mason Machine Works	Taunton.
William B. Fitz	West Boylston Manufg. Co.	Oakdale.
Frederick A. Flather	Lowell Machine Shop	Lowell.
Allan V. Garratt	61 Codding St.	Boston.
Royal W. Gates	Leather Belting	Lowell.
Charles E. Getchell	Waltham Bleachery	Waltham.
William C. Godfrey	Indian Orchard Co.	Indian Orchard.

Alfred M. Goodale	Boston Manufg. Co.	50 State St. Boston.
Charles J. Goodwin	Indian Orchard Mills	Indian Orchard.
George P. Grant, Jr.	Grant Yarn Co.	Fitchburg.
Stephen Greene	Mill Engineer	Boston.
John Gregson	Merchants Manufg. Co.	Fall River.
Frank R. Hadley	Bennett Manufg. Co.	New Bedford.
Frank J. Hale	Pettee Machine Works	Newton Upper Falls.
William E. Hall		Bondsville.
Z. D. Hall	Berkshire Cotton Manufg. Co.	Adams.
John F. Hamlet	Manchaug Co.	Manchaug.
Henry F. Harris	West Boylston Mannfg. Co.	Worcester.
John J. Hart	Merrimack Print Works	Lowell.
A. M. Hathaway	H. N. Slater Mills	Webster.
William Hathaway	Barnard Manufg. Co.	Fall River.
William B. Hawes	No. Dighton Cotton Co.	Fall River.
John H. Haworth	Haworth & Watson	Lowell.
James G. Hill	Lawrence Manufg. Co.	Lowell.
William R. Hill	Glasgow Manufg. Co.	So. Hadley Falls.
Geo. H. Hills	Davol Mills	Fall River.
Chas. H. Hobbs	Thorndike Co.	Thorndike.
Gideon F. Holmes	Plymouth Cordage Co.	North Plymouth.
Henry A. Holcomb	New Bedford Boiler Co.	New Bedford.
Geo. L. Hooper	Shaw Stocking Co.	Lowell.
Henry S. Houghton, Jr.	Paul Whitin Manufg. Co.	Northbridge.
Henry S. Howe	Lawrence & Co.	Boston.
W. S. Hume	Tremont and Suffolk Mills	Lowell.
C. H. Hutchins	Knowles Loom Works	Worcester.
Wm. B. Kehew	The Kehew-Bradley Co.	Boston.
Roland R. Kelly	Williamstown Manufg. Co.	Williamstown.
William J. Kent	Wamsutta Mills	New Bedford.
Nathaniel B. Kerr	Grinnell Manufg. Co.	New Bedford.
John Kilburn	Lawrence Manufg. Co.	Belmont.
Fred Lacey	Greylock Mills	North Adams.
Josiah M. Lasell	Whitin Machine Works	Whitinsville.
Abbott F. Lawrence	Nemasket Mills	Taunton.
Evan Arthur Leigh	E. A. Leigh & Co.	Boston.
Ernest Lovering	Lyman Mills	Holyoke.
Henry M. Lovering	Whittenton Manufg. Co.	Taunton.
William M. Lovering	Whittenton Manufg. Co.	Taunton.
Arthur H. Lowe	Parkhill Manufg. Co.	Fitchburg.
Stephen C. Lowe	Mill Supplies	New Bedford.
David Lowe	Parkhill Manufg. Co.	Fitchburg.
J. S. Ludlam	Merrimack Manufg. Co.	Lowell.
Alvin S. Lyon	Lowell Manufg. Co.	Lowell.
Herbert Lyman	Hadley Co.	Boston.
Chas. L. Macomber	Nemasket Mills	Taunton.

Charles T. Main	Mill Engineer	Boston.
Philip A. Mathewson	Chace Mills	Fall River.
Rufus A. Maxfield		Lowell.
Fred C. McDuffie	Everett Mills & York Manufg. Co.,	Boston.
William G. McLoon	Boston Manufg. Co.	Waltham.
William P. McMullan	Naumkeag Steam Cotton Co.	Salem.
Geo. H. Meader	Steam Appliances	Boston.
John Tempest Meats	Mason Machine Works	Taunton.
James I. Milliken	Everett Mills	Lawrence.
A. B. Mole	Greylock Mills	North Adams.
Edward A. Mongeon	Blackstone Manufg. Co.	Blackstone.
Fred W. Moore	Cordis Mills	Millbury.
George F. Morgan	Lowell Machine Shop	Lowell.
Geo. B. Morison	Hadley Co.	Boston.
Albert H. Morton	Kitson Machine Co.	Lowell.
Oliver H. Moulton	Hamilton Manufg Co.	Lowell.
Roscius C. Newell	Palmer Mill	Three Rivers.
William G. Nichols	Glasgow Manufg. Co.	South Hadley Falls.
Franklin Nourse	Lawrence Manufg. Co.	Lowell.
Warren M. Orswell	Orswell Mills	Fitchburg.
Oscar L. Owen	Whitin Machine Works	Whitinsville.
Sidney B. Paine	General Electric Co.	Boston.
Francis J. Parker	Monadnock Mills	Boston.
Walter E. Parker	Pacific Mills	Lawrence.
John W. Pead	Merrimac Manufg. Co.	Lowell.
Haven C. Perham	Kitson Machine Co.	Lowell.
Andrew G. Pierce, Jr.	Pierce Manufg. Corp.	New Bedford.
Henry C. Phillips	Sutton Manufg. Co.	Wilkinsonville.
M. W. Quinn	Hamilton Woolen Co.	Amesbury.
T. G. Ramsdell	Monument Mills	Housatonic.
Charles F. Randall	Expert in Textiles	Boston.
M. A. Rawlinson	Tremont and Suffolk Mills.	Lowell.
Robert Redford	Arlington Mills	Lawrence.
James Renfrew	Renfrew Manufg. Co.	Adams.
F. H. Rice	Holbrook Mills	West Boylston.
C. H. Richardson	Appleton Company	Lowell.
Charles E. Riley	Textile Machinery	Boston.
C. E. Roberts	Hartford St. Boiler Insp. & Ins. Co.,	Boston.
John M. Russell	Knowles Loom Works	Worcester.
Arnold B. Sanford	Globe Yarn Mill	Fall River.
J. H. Sawyer	Newmarket Manufg. Co.	Boston.
Thomas C. Sheldon	Fitchburg Duck Mills	Fitchburg.
William F. Sherman	Atlantic Cotton Mills	Lawrence.
Charles M. Shove	Granite Mills	Fall River.
Francis H. Silsbee	Pacific Mills	Lawrence.
Abbott E. Slade	Laurel Lake Mills	Fall River.

Arba C. Slater	Linwood Mills	Whitinsville.
William S. Southworth	Mass. Cotton Mills	Lowell.
Lewis R. Speare	Mill Supplies	Boston.
Henry C. Spence	Metallic Drawing Roll Co.	Indian Orchard.
Walter F. Stiles	Nockege and Ormswell Mills	Fitchburg.
O. W. Stites	W. C. Plunkett & Sons	Adams.
Joseph Stone	53 State St., Room 949	Boston.
Albert A. Sweet	King Philip Mills	Fall River.
Cyrus A. Taft	Whitinsville Machine Works	Whitinsville.
Geo. P. Taylor	Lancaster Mills	Clinton.
James W. Taylor	Canoe River Mills	Taunton.
Richard Thackeray	Weetamoe Mills	Fall River.
Earl A. Thissell	Central Oil Gas Stove Co.	Florence.
Edward W. Thomas	Tremont and Suffolk Mills	Lowell.
Ralph E. Thomson	Parkhill Manufg. Co.	Fitchburg.
Wm. V. Threlfall	Pettee Machine Works	Newton Upper Falls.
G. A. Thudium	Victoria Size	Malden.
James P. Tolman	Samson Cordage Works	Boston.
Geo. W. Towne	Arlington Mills	Lawrence.
Oscar B. Truesdell	Fiskdale Mills	Fiskdale.
Geo. E. Tucker	Otis Co.	Ware.
Jude C. Wadleigh	Mass. Cotton Mills	Lowell.
Justin A. Ware	Crompton Loom Works	Worcester.
James Waring	Narragansett Mills	Fall River.
Walter S. Watson	Haworth & Watson	Lowell.
J. W. Wattles	Supplies	Canton.
George W. Weeks	Lancaster Mills	Clinton.
Channing Whitaker	Lowell Machine Shop	Lowell.
Arthur F. Whitin	Sanders C. Mills, Whitinsville C. Mills	Whitinsville.
G. Marston Whitin	Whitinsville Machine Works	Whitinsville.
Henry T. Whitin	Rockdale Mill	Northbridge.
Alfred N. Whiting	L. M. Harris Manufg. Co.	Oakdale.
William S. Whitney	Box 209	Fall River.
Henry M. Wilcox	John Rhodes Warp Co.	Millbury.
Theop. W. Wilmarth	Millbury Cotton Mill	Millbury.
Thomas Wilmarth	Saunders Cotton Mills	Saundersville.
A. S. Winslow	Peabody Company	Newburyport.
C. J. H. Woodbury	Secretary and Treasurer	Lynn.
Alvin Woodman	32 Wilder St.	Brockton.
Erving Y. Woolley	152 Congress St.	Boston.

RHODE ISLAND.

Stephen L. Adams	Stafford Manufg. Co.	Central Falls.
Charles T. Aldrich	Aldrich Manufg. Co.	Providence.
William Ames	Fletcher Manufg Co.	Providence.

Abel T. Atherton	A. T. Atherton Machine Co.	Pawtucket.
George R. Babbitt	American Oil Co.	Providence.
Edward R. Ballou	1 Hazard Ave.	Providence.
Truman Beckwith	Dyerville Manufg. Co.	Providence.
William W. Blades	Crefeld Mills	Westerly.
Arthur F. Brackett	Riverpoint and Arctic Mills	Riverpoint.
D. Russell Brown	Mill Supplies	Providence.
H. Martin Brown	Mill Supplies	Providence.
E. C. Bucklin	Interlaken Mills	Providence.
Malcolm Campbell	Woonsocket Machine & Press Co.	Woonsocket.
Arnold B. Chace, Jr.	Valley Falls Co.	Woonsocket.
Fred A. Chase	Mill Supplies	Providence.
Chas. H. Child	Brown Bros. Co.	Providence.
Frank B. Comins	Aerphor Co.	Providence.
Andrew J. Currier	Albion Mills	Albion.
Frederick I. Dana	Thomas Phillips Co.	Providence.
A. Lockwood Danielson	Quinebaug Co.	Providence.
J. DeForest Danielson	Lockwood Co.	Providence.
John W. Danielson	Cotton Manufacturer	Providence.
William P. Dempsey	Dempsey Bleachery	Pawtucket.
R. H. Deming	Cotton Merchant	Providence.
Herbert R. Farnum	Bernon Manufg. Co.	Georgiaville.
J. Herbert Foster	Cotton Merchant	Providence.
Geo. A. Fuller	Stedman & Fuller Manufg. Co.	Providence.
William Gammell	Berkeley Co.	Providence.
Charles H. Gorton	Ballou Mill	Woonsocket.
William B. Gowdey	Mill Supplies	Providence.
William S. Granger	Granger Foundry & Machine Co.	Providence.
George P. Grant	Greene & Daniels Manufg. Co.	Pawtucket.
R. A. Gray	Rodman Manufg. Co.	Allenton.
William C. Greene	Peacedale Manuf. Co.	Peacedale.
Frederick Grinnell	General Fire Extinguisher Co.	Providence.
Arthur H. Gulliver	Lonsdale Co.	Ashton.
John H. Hambly	Quidnick Manufg. Co.	Providence.
Frank Harris	Hamlet Mills	Woonsocket.
A. Walter Harris	A. W. Harris Oil Co.	Providence.
William P. Holt	Slatersville Mills	Slatersville.
Elisha H. Howard	Harris Manufg. Co.	Providence.
David Jackson	Jackson Pat. Shell Roll Co.	Pawtucket.
J. E. Jenckes	E. Jenckes Co.	Pawtucket.
W. E. Keach	57 Harrison St.	Pawtucket.
Joseph H. Kendrick	American Supply Co.	Providence.
John M. Kimball	Slatersville Mills	Slatersville.
Albert Knight	Quidnick Manufg. Co.	Anthony.
Jessie A. Knight	Enfield Mills	Enfield.
Stephen A. Knight	Hebron Manufg. Co.	Box 820, Providence.

Walter B. Knight	Reynolds Manufg. Co.	Davisville.
Harold Lawton		Centreville.
J. Colby Lewis	Centreville Cotton Mill	Centreville.
Charles W. Lippitt	Social Manufg. Co.	Providence.
Henry F. Lippitt	Social Manufg. Co.	Providence.
Jas. R. MacColl	Lorraine Manufg. Co.	Pawtucket.
Charles R. Makepeace	Mill Engineer	Providence.
Arthur B. Mann	U. S. Cotton Co.	Central Falls.
F. H. Maynard	General Fire Extinguisher Co.	Providence.
Thomas Mayor	Textile Machinery	Providence.
Charles H. Merriman, Jr.	Social Mfg. Co.	Woonsocket.
O. B. Parker	U. S. Cotton Co.	Central Falls.
Geo. C. Phillips	Thomas Phillips Co.	Providence.
Wm. C. Pierce	Elizabeth Mills	Providence.
Stephen Minot Pitman	Narragansett Fire Insurance Co.	Providence.
Thomas C. Powell	Treas. Slatersville Mills	Providence.
R. H. Rice	Rice & Sargent Steam Engine Co.	Providence.
Charles D. Robinson	Crompton Co.	Crompton.
Charles H. Savage	Manville Co.	Manville.
Arnold Schaer	Warren Manufg. Co.	Warren.
Frank P. Sheldon	Mill Engineer	Providence.
George E. Sherman		Central Falls.
George W. Stafford	Knowles Loom Works	Providence.
Herbert H. Shumway	B. B. & R. Knight	Providence.
W. H. Summersby	Pontiac Bleachery	Pontiac.
Daniel J. Sully	Cotton Broker	Providence.
Edward P. Taft	Ponemah Mills	Providence.
Robert W. Taft	Coventry Co.	Providence.
Ariel C. Thomas	Clinton Manufg. Co.	Woonsocket.
Charles E. Thomas	Forestdale Manufg. Co.	Woonsocket.
D. M. Thompson	Corliss Steam Engine Co.	Providence.
Robert B. Treat	Centreville Cotton Mills	Centreville.
John Waterman	Warren Manufg. Co.	Warren.
A. Tenny White	Globe Mill	Woonsocket.

CONNECTICUT.

Joseph D. Aiken	Ponemah Mills	Taftville.
H. C. Atwood	Williamsville Manufg. Co.	Killingly.
James A. Atwood	Wauregan Manufg. Co.	Wauregan.
John Walter Atwood	Wauregan Manufg. Co.	Wauregan.
W. E. Atwood	Williamsville Manufg. Co.	Killingly.
George S. Barnum	The Bigelow Co.	New Haven.
E. S. Boss	Willimantic Linen Co.	Willimantic.
Walter D. Brigham	Willimantic Linen Co.	Willimantic.
W. R. Burnham	Uncasville Manufg. Co.	Norwich.

Chauncey C. Chase	Attawaugan Mills	Killingly.
John Eccles	Ponemah Mills	Taftville.
C. H. Frisbie	Attawaugan Mills	Norwich.
George W. Holt	Monohansett Manufg. Co.	Putnam.
Harry W. Kimball	Jewett City Mills	Jewett City.
Ira J. Martin	Bozrahville Manufg. Co.	Bozrahville.
Frank M. Messenger	Grosvenor Dale Co.	No. Grosvenor Dale.
Moses Pierce	Norwich Bleachery	Norwich.
John Scott	Willimantic Linen Co.	Willimantic.
Robert R. Smith	Greenwoods Co.	New Hartford.
James O. Sweet	Ashland Cotton Co.	Jewett City.
Robert Rennie Taft	Baltic Mills Power Co.	Baltic.
E. B. Wilbur	Pequot Mills	Montville.
A. A. Young, Jr.	Jewett City Mills	Jewett City.
Adelbert R. Young	Ashland Cotton Co.	Jewett City.

NEW YORK.

George Arms	Grand Hotel	New York City.
Edwin H. Baker	Bliss, Fabyan & Co.	New York City.
D. W. Gray	Skenandoa Cotton Co.	Utica.
J. O. Hannum	Saratoga Victory Manufg. Co.	Victory Mills.
David S. Johnston	Cohoes Fdy. & Machine Co.	Cohoes.
William L. Lyall	J. & W. Lyall, 540 W. 23d St.	New York City.
Henry F. Mansfield	Utica Steam Cotton Mills	Utica.
J. E. Prest	Harmony Mills	Cohoes.
G. H. Sayward	Standard Yarn Co.	Oswego.

NEW JERSEY.

Ernest Bridge	Jas. Chadwick & Bro., Ltd.	Jersey City.
J. William Clark	Clark Thread Co.	Newark.
John W. Ferguson	Mill Engineer	Paterson.
Philip H. Fowler		Gloucester.
Wm. B. Munroe	Millville Manufg. Co.	Millville.
John K. Russell	May's Landing Water Power Co.	Vineland.
H. E. Walmesley	Clark Thread Co.	Newark.
William Whittam, Jr.	Jas. Chadwick & Bro., Ltd.	Jersey City.

PENNSYLVANIA.

James Butterworth	H. W. Butterworth & Sons	Philadelphia.
Richard Garsed	Wingohocking Mills	Philadelphia.
William E. McGill		Philadelphia.
S. S. Spencer	Conestoga Steam Mills	Lancaster.
William E. Trainer	Linwood Mills	Trainer.
George Wood	Milville Manufg. Co.	Philadelphia.

DELAWARE.

William P. Bancroft	Jas. Bancroft & Sons Co.	Wilmington.

MARYLAND.

James A. Gary	Gary Manufg. Co.	Baltimore.

NORTH CAROLINA.

John W. Arrington	Edna Cotton Mills	Reidsville.
Philip S. Baker	Crowders Mt. Cotton Mills	Kings Mt.
H. S. Chadwick	Dover Yarn Mills	Charlotte.
F. Dilling	Dilling Cotton Mills	Kings Mt.
C. E. Falls	Enterprise Manufg. Co.	Kings Mt.
W. T. Jordan	Mt. Island Manufg. Co.	Mt. Island.
Fred S. Mosher	Henrietta Mills	Henrietta.
E. A. Smith	Charlotte Supply Co.	Charlotte.
D. A. Tompkins	Atherton Cotton Mills	Charlotte.
J. P. Wilson	Dover Yarn Mills	Charlotte.

SOUTH CAROLINA.

B. F. Guy	Pelzer Manufg. Co.	Pelzer.
Horace L. Hayden	Walhalla Cotton Mills	Walhalla.
Charles K. Oliver	Columbia Mills Co.	Columbia.
Arthur T. Smith	Langley Manufg. Co.	Langley.
Ellison A. Smyth	Pelzer Manufg. Co.	Pelzer.
Leroy Springs	Lancaster Cotton Mills	Lancaster.
W. B. Smith Whaley	Richland Cotton Mills	Columbia.
H. D. Wheat	Gaffney Manufg. Co.	Gaffney.

GEORGIA.

Henry E. Fisher	Atlanta Cotton Mills	Atlanta.
Arthur W. Hunking	Mass. Mills in Georgia	Rome.
Otis G. Lynch	Enterprise Manufg. Co.	Atlanta.
Albert G. Martin	Kincaid Manufg. Co.	Griffin.
James R. Pearce	Fulton Cotton Spinning Co.	Altanta.
Joel Smith	J. P. King Mills	Augusta.
George R. Stearns	Riverside Mills	Augusta.
Osmon D. Tilton	Exposition Cotton Mills	Atlanta.

KENTUCKY.

John Hopkinson	Slagden & Kuckney Woolen Mill	Stamford.

TENNESSEE.

T. B. Dallas	Phœnix Cotton Mills	Nashville.

MISSOURI.

D. C. Ball	Amer. Cotton Bale Imp. Co.	St. Louis.

LOUISIANA.

S. Odenheimer	Lane Mills	New Orleans.

ARKANSAS.

Wm. Emmett Anderson	Standard Circular Cotton Co.	Little Rock.

TEXAS.

C. H. Botsford	Amer. Cotton Bale Imp. Co.	Waco.
D. M. Ehrlich	Galveston C. & W. Mills	Galveston.
Lawrence V. Elder	Galveston C. & W. Mills	Galveston.

CANADA.

Chas. Owen Dexter	Canadian Colored Cot. Mills, Ltd.	Hamilton, Ont.
Alfred Hawkesworth	Merchants Manufg. Co.	Montreal, P. Q.
Farquarson J. Muir	Canadian Col. Cotton Co.	Hamilton, Out.
Louis Simpson	Montreal Cotton Co.	Valleyfield, P. Q.

NEW BRUNSWICK.

John H. Parks	Parks Sons Mills	St. John.

CHINA.

A. W. Danforth	Shanghai Cotton Cloth Mill Co.	Shanghai.

RECAPITULATION.

LOCATION OF MEMBERSHIP.

Maine	21
Mew Hampshire	25
Vermont	1
Massachusetts	203
Rhode Island	83
Connecticut	24
New York	9
New Jersey	8
Pennsylvania	6
Delaware	1
Maryland	1
North Carolina	10
South Carolina	8
Georgia	8
Kentucky	1
Tennessee	1
Missouri	1
Louisiana	1
Arkansas	1
Texas	3
Canada	4
New Brunswick	1
China	1
Total	423

IN MEMORIAM.

CHAUNCEY C. CHASE.

Mr. CHAUNCEY C. CHASE, late superintendent of the Attawaugan Mills, Killingly, Conn., died suddenly April 13, 1895, as the result of an accident by which he was caught in the elevator at the mill and was so severely injured that he lived only a few hours.

Mr. CHASE was born in Killingly, Jan. 16, 1850, and always resided in that town. He entered the mill in 1858 and continued employment in the same company until his death, filling several positions to which he was advanced by promotion, until he was appointed superintendent in 1884.

In 1868 he married Miss Elizabeth Harrington, who, with four children, survives him. He was a member of the Methodist Church and took a great interest in its welfare. He was a member of this Association and regularly attended the meetings and took a great deal of interest on these occasions, although he was never heard in discussions on the floor.

His long experience in the mill and his strict attention to detail and personal integrity rendered him a valuable man to his employers in the executive position at the head of the establishment.

CALL FOR MEETING.

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

Atlanta Meeting, No. 59.

BOSTON, MASS., Oct. 7, 1895.

Dear Sir:

In accordance with the mail vote of the members, it has been decided that the stated semi-annual meeting of the Association will be held at Atlanta, Georgia, on Thursday and Friday, October 24 and 25, 1895, for which permission has been given by the special act of the Massachusetts Legislature, Chapter 163, Acts of 1895, authorizing the New England Cotton Manufacturers' Association to hold its meetings without the Commonwealth, as follows:

SECTION 1. The New England Cotton Manufacturers' Association is hereby authorized to hold its meetings in any state or territory of the United States and in the District of Columbia, provided, however, that its annual meeting shall be held in this Commonwealth at least once in five years.

A special train will be provided for the party, leaving Boston on Monday, October 21, from the Park Square railway station at 6 o'clock, P. M., and leaving New York City from the Liberty Street ferry of the Central railroad of New Jersey on Tuesday, October 22, at 8 A. M., returning to Boston on the morning of October 31st. This train will be under the charge of Messrs. Raymond & Whitcomb, 296 Washington St., Boston, Mass., to

whom all communications for tickets, accommodations, or other matters pertaining to the itinerary should be addressed.

Copies of the itinerary have been mailed to members of the Association, and Messrs. Raymond & Whitcomb will send copies on application.

The sessions will be held, by courtesy of the management, in the Auditorium Building of the Cotton States and International Exposition, beginning at 10 A. M. each day, and sessions at other hours will be decided upon at that time.

At a meeting held at Atlanta, Ga., September 13th, a Joint Committee was appointed from the Chamber of Commerce, City Council and the Exposition Company, consisting of Mr. H. M. INMAN, Chairman; Mr. M. F. AMOROUS, Secretary; and Messrs. JAMES W. ENGLISH, R. B. BULLOCK, T. B. NEAL and C. A. COLLIER from the Chamber of Commerce; Messrs. W. S. BELL, JOSEPH HIRSCH, and N. P. CAMP from the City Council; and Messrs. H. T. INMAN, M. F. AMOROUS, A. J. WEST, and W. H. BALDWIN from the Exposition Company.

The purpose for which this committee was constituted being to tender the use of the Auditorium on the Exposition grounds for the sessions of the Association, for securing accommodations for the members where arrangements are not yet completed, and "the committee tender their services in every way possible to add to the pleasure of the visit." A banquet to the members of the Association will be one of the leading features of the entertainment.

At Charlotte, N. C., the party will be the guests of the Manufacturers' Club, and during their stay arrangements will probably be made for a special train enabling a short visit to be made to Pelzer.

While at Atlanta the party may have an opportunity to visit Columbus, Georgia.

Due notice will be given at Atlanta of any special arrangements at Chattanooga, in addition to the statement in the itinerary.

Hon. GEORGE B. GOULD, Mayor of Nashville, Tenn., invites

the members of the party to stop over on the return trip, but the arrangements for the itinerary are such that it will not be feasible for the Association to accept this hospitable courtesy.

It is essential that members of the Association who go to the meeting on other than the special train should leave their names and local addresses with the secretary at the Kimball House.

In accordance with the vote of the Association at the Providence meeting, the papers will be printed in advance for the use of members, and sent as soon as the series are printed to those members who apply to Raymond & Whitcomb for tickets. On application to the secretary advance copies will also be sent to any members not attending the meeting.

It is sincerely hoped that members who do not expect to be present will contribute written discussions upon papers and topical questions.

The meeting will be opened at the Auditorium of the Cotton States and International Exposition, on Thursday, October 24th, at 10 A. M., with greetings by southern friends prominent in official and civil affairs, after which the following papers will be presented:

1. The Present Development of the Northrop Loom.
   Mr. George Otis Draper, Hopedale, Mass.
2. Improvement of Cotton.
   Mr. Edward Atkinson, Boston, Mass.
3. Cloth and Yarn Calculation Simplified.
   Mr. Arnold Schaer, Warren, R. I.
4. An Improved Method for Preparing Cotton for Market.
   Mr. W. E. Anderson, Little Rock, Ark.
5. Improvements in Baling and Handling Cotton.
   Mr. D. C. Ball, St. Louis, Mo.
6. Baling and Compressing Cotton.
   Mr. Jerome Hill, St. Louis, Mo.

7. Growth and Advantages of Cotton Manufacturing in the South.
Mr. RICHARD H. EDMONDS, Baltimore, Md.

8. Cotton Mill Building in the South.
Mr. W. B. SMITH WHALEY, Columbia, S. C.

9. The Unmerchantable Method of Baling American Cotton.
Gen. STEPHEN M. WELD, Boston, Mass.

10. The Cultivation, Picking, Baling and Manufacturing of Cotton from a Southern Standpoint.
Mr. D. A. TOMPKINS, Charlotte, N. C.

11. Some of the Disadvantages Experienced by the Manufacturer Through Poor Ginning and Baling of Cotton.
Mr. EDWARD W. THOMAS, Lowell, Mass.

12. The Relations of Employers to Employees.
Mr. HERBERT E. WALMSLEY, Newark, N. J.

13. Sea Island Cotton.
Mr. ELIAS L. RIVERS, James Island, S. C.

14. Topical questions will be taken up in order as occasion offers during the sessions.

The election of new members will be held at some time during the meeting, and it is desired that all who are proposed for membership will attend this meeting.

Admission fees are not required in advance, and notices of election and bills will be sent to new members after the meeting.

Blank propositions for membership and lists of members will be sent on application to the office of the Association.

Propositions for membership should be received at the office of the Association not later than Saturday, October 19th.

Mail and telegrams for members during the Atlanta Meeting can be sent in care of Kimball House, Atlanta, Ga.

By order of the Board of Government.

C. J. H. WOODBURY,
Secretary.

NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION.

TOPICAL QUESTIONS.

COTTON STATES AND INTERNATIONAL EXPOSITION,
ATLANTA MEETING, No. 59, THE AUDITORIUM, ATLANTA, GA.

October 24, 25, 1895.

Dear Sir:

These topical questions upon the live issues of cotton manufacturing, suggested by various members, are presented with the approval of the Board of Government for discussion, with remarks not exceeding five minutes by any speaker.

It is expected that the members will show their approval of this new feature and warrant its continuance by promptly entering upon the discussions and submitting facts and opinions bearing directly upon the questions, thus giving the Association benefits derived from practical experience and observation.

Members who do not expect to be present are especially requested to contribute written discussions upon any of the questions.

Members notifying the Secretary in advance of their willingness to speak upon any particular topical questions will be given precedence by the President.

Suggestions for other questions, to be discussed at future meetings, may be given to the Secretary.

By order of the Board of Government,

C. J. H. WOODBURY,
P. O. Box 3672, BOSTON,
Secretary.

TOPICAL QUESTIONS.

30. Tare on cotton. Is it not excessive? Can agitation among manufacturers have any effect to reducing weight of hoops, sacking, etc.?

33. What is the best method of sizing cotton warps?

36. What is the best number of wire and number of points, per square foot, for cylinders, doffers and flats, for the plain top card?

a. On breaker carding?
b. On finisher carding?
c. On single carding?
d. Also on the cylinders, doffers and flats of revolving flat cards?

40. What is the best running time for our mills? Best time to start? Best time to stop? Best length of time for noon hour, etc.? Any good points in the English method? Is there anything to be gained to the mills and employees by a standard uniform system?

41. What type of boiler is most economical for high pressures; cost of installation, operation, and depreciation being considered?

42. Is the economy obtained with steam jacketed cylinders sufficient to warrant the extra cost and risk incurred by their use?

43. Is the cone warper an improvement? If so, in what respect?

44. Will a picker take out more dirt by introducing air in the end of the bonnet than it would to draw the air over the grid bars?

45. The new French beater, its work on ordinary cotton and long staples.

46. How can exhaust steam be best utilized in a cotton mill?

47. What is the best method of automatically stopping an engine in case the governor fails to operate?

48. Is there any practical difficulty in the way of regulation of engines and water-wheels when working together?

49. What have you learned from your experience with mill fires during the past year?

50. The relative importance of vapor, steam, the aerphor, and the Sturtevant blower system?

51. What principle of first picker or opener is best adapted for

a. Middling American Cotton.
b. Long staple peeler Egyptian and Sea Island Cotton.
c. What relation should the speed of the beaters in all picking room machinery have to the grade of stock being used?

52. If upright boilers are used, will the steam be made more cheaply by using all soft coal, or by mixing soft coal and buckwheat coal?

53. How much can be gained by using a forced draft, when the chimney draft is not enough to give thorough combustion?

54. What is the best method of returning condensed steam to the boilers?

55. Can oil in condensed steam be separated by any means so that the water can with safety be returned to the boiler?

Questions whose consideration has not been completed at this meeting will be taken up at the next meeting of the Association.

THE EXCURSION.

When the question of holding the autumn meeting at the South was first broached by some of the members living in that portion of the country, and was followed by numerous invitations from civic and industrial associations in that section of the country, the Board of Government felt that the decision of a question of such great importance, and for which there was no precedent in the past career of the Association to furnish guidance, should be voiced by the members rather than by an exercise of its authority under the constitution and by-laws of the Association. It was decided that the matter should be left to a referendum of the membership, and President A. M. GOODALE and Mr. ARTHUR H. LOWE were appointed a committee by the Board of Government on the fall meeting, and issued the following notices to all the members:

BOSTON, MASS., Aug. 5, 1895.

The Cotton States and International Exposition opens at Atlanta, Georgia, September 18th, and closes December 31st of the current year. The enclosed circular gives a full description of the same. The object of the Exposition is to show the Agricultural, Manufacturing, and Mining resources of the South.

The Board of Government has been considering the feasibility of holding the October meeting of the Association at Atlanta in the latter part of October. Preliminary inquiries have been made regarding rates, and the fare from Boston to Atlanta and return, including Pullman

service and meals *en route* will be less than $50.00. This does not include hotel accommodations at Atlanta. Before taking any further steps in the matter the Board desires to ascertain how many members of the Association would go to Atlanta, and to ascertain this, the present circular is sent. It is unnecessary to enumerate the advantages that would accrue to New England manufacturers from a more extended acquaintance with Southern men, and their methods of manufacture. The Board believes that if the October meeting can be held during the Exposition it will result in great good to the Association. In case of a favorable response, arrangements can be made so that we can go south by one route and return by another route. Arrangements can be made to visit some representative southern mills.

Letters have been received by the Board from the management of the Exposition, and from many prominent men of the South, urging that our next meeting be held in Atlanta. An extract from one letter reads as follows:

"I am anxious to see the people of New England and the people of the South become more thoroughly acquainted with each other. I believe that this can be done to better advantage by bringing them into personal contact than in any other way. I believe that the development of the South means the enrichment of the entire nation, and that New England can advance its own interests as well as the interests of the South and of the country at large by taking an active part in the industrial progress of the Southern States. I can assure you that the people of the South will welcome most heartily such a meeting as this in Atlanta. You would find manufacturers, business men and all others ready to give the warmest possible welcome, not only from a matter of hospitality, but from business relations."

The time necessary would be one week, leaving Boston probably on one Saturday and returning a week from the following Sunday.

The Board realizes that the suggestion is an important one, and believes that much good to the Association would result from the trip; but it also realizes that the expense would be heavy, perhaps too much so for a majority of the members. It therefore purposes, as an alternative, a meeting at the Profile House in the White Mountains during the latter part of September, and asks from the members a mail vote as to their preference between Atlanta and the Profile House. The fare from Boston to the Profile House would be $5.50 for the round trip, and all side trips in the mountains can be made for one-half regular rates. The

mountain meeting, if decided on, would be for two days, Thursday and Friday, September 26th and 27th, and the rate at the Profile House would be $3.00 per day.

Enclosed you will find a postal card on which you are requested to state your preference as to whether the October meeting be held in Atlanta or at the Profile House. Please express your intention thereon and return same to the Secretary.

Mail the postal card so that it can be received by the Secretary prior to August 10th.

For the Board of Government,

A. M. GOODALE,
ARTHUR H. LOWE.

The majority of the returns were in favor of Atlanta as a place of meeting; a minority preferring the Profile House, White Mountains, and a few were indifferent. There were a small number of postal cards returned after the date fixed for counting, but they would not have affected the result.

Under the guidance of this referendum the Board of Government appointed Atlanta as the place for the Fall Meeting, and a contract was entered into with Messrs. Raymond & Whitcomb for the transportation of the party to Atlanta and return, and the committee issued the following notice:

BOSTON, MASS., Sept. 13, 1895.

To the members:

The members have decided by the mail vote recently taken to hold the autumn meeting at Atlanta, Ga., during the Cotton States and International Exposition. The Board of Government, acting on this preference of the members, has decided to hold the next meeting on October 24th and 25th at Atlanta.

In order that the members may have special facilities for both going and returning, the Board of Government has given entire charge of the excursion to Atlanta and return into the hands of Raymond & Whitcomb. The excursion will leave Boston Monday, October 21st, at 6 P. M.; about six hours will be spent in Washington, and about the same time in Charlotte, N. C., and the special train reaches Atlanta on Wednesday early in the evening.

The meetings of the Association will be held Thursday and Friday, leaving Saturday and Sunday free for other engagements.

Returning, the party will leave Atlanta early Monday morning via Rome, Ga , Chattanooga and the Shenandoah Valley, reaching Boston early Wednesday morning, October 30th.

The entire expense of the whole trip, as per itinerary, including hotel accommodations at the Kimball House, Atlanta, will be $75 from Boston and $65 from New York, for each person.

Advices already received by the Board of Government indicate that a large number of the members will avail themselves of the privileges offered by this excursion; and the Board desires to impress on each member that no more favorable opportunity could be offered for visiting the South. Unusual preparations have already been made by the Southern members of the Association, the officials of the Exposition, the manufacturers, railroad managers, and prominent men of the South, to welcome the Association. Letters are constantly being received stating the extent of these preparations, and the strong desire of the Southern people that we should visit them.

The programme of the meeting can at this time be stated only in outline. The key-note of the meeting will be the cultivation, picking, ginning, baling and shipment of cotton, viewed from the varied standpoints of planters, manufacturers, buyers and underwriters. Full details of the meeting will be given in the Secretary's notice, which will be issued at a later day, when all arrangements are made.

A pamphlet will be sent you containing all details of the trip, issued by Messrs. Raymond & Whitcomb, 296 Washington Street, Boston, Mass., to whom all correspondence relating to tickets or the trip must be addressed.

Members are allowed the privilege of inviting guests to participate in the low rates of this excursion, but it is possible that some courtesies may be extended to the Association which will, of necessity, be confined to the members of the Association.

It is important that members intending to join the excursion should notify Messrs. Raymond & Whitcomb as soon as possible.

A. M. GOODALE, } *Committee on*
A. H. LOWE, } *Atlanta Meeting.*

The following itinerary was issued by Messrs. Raymond & Whitcomb, and sent to the members:

The forthcoming excursion of the New England Cotton Manufacturers' Association to Atlanta, Ga., will be rendered exceedingly attractive in many ways. The visit to the chief industrial centre of the South will be made at a time when the great Cotton States Exposition will be in the fullest operation, and at a time when that handsome and enterprising city presents a most attractive appearance. The season selected is also when travel becomes most delightful. For much of the way through the Southern States — for the entire distance, in fact, beyond Washington — different routes are taken going and returning, rendering the trip doubly interesting on account of the wide extent of country traversed, and the many glimpses to be obtained *en route* of picturesque and historic scenes and of the many evidences of Southern commercial progress. The tour will give unsurpassed opportunities to the members of the Association to view the cotton fields and the processes of cotton picking, cotton ginning and packing, and to visit some of the cotton mills of the South. The runs through the most interesting sections of country will be made in daylight, and every arrangement possible will be made to give the members opportunities to see all the interesting and instructive sights of the cotton industry. The announcement of a visit from the Association has already awakened much interest and enthusiasm at Atlanta and elsewhere, and many special courtesies have been tendered which will serve to make the tour socially a season of great enjoyment.

The business details of the trip have been placed in the hands of Messrs. Raymond & Whitcomb, and no efforts will be spared to make the excursion in every way a complete success. The itinerary, as outlined elsewhere, gives the daily movements of the party and all essential particulars relating to the tour. In brief, it has been planned to go from Boston to New York by the Fall River Line on the night of Monday, October 21st. Passengers who find it more convenient to take the all-rail route between Boston and New York will be enabled to do so. Tuesday forenoon will be occupied in the transit from New York to Washington over the Royal Blue Line, and there will be a halt at the National Capital of six hours. Taking the Southern Railway Company's line from Washington southward, the party will reach Charlotte, N. C., Wednesday morning. Here another half day's stop will be made. Atlanta will be reached Wednesday evening, and while in that city the party will make its headquarters at the well-known and spacious Kimball House, which has recently undergone a complete renovation, under

the direction of its new manager, Mr. Warren Leland, Jr. Four days will be passed in Atlanta, and the return trip will not be entered upon until Monday morning, October 28th. The first stage of the return journey will be over the Southern Railway Company's line *via* Rome, Ga., to Chattanooga, where a half day's sojourn will be made. From Chattanooga northward the route lies over the Southern Railway Company's line *via* Roanoke, Va., and the Shenandoah Valley, and the Baltimore & Ohio Railway through the Potomac Valley. The most interesting part of the route will be traversed in daylight. The Royal Blue Line again furnishes the route of transit between Washington and New York, from which latter city there will be speedy means of reaching all New England points the ensuing morning.

ITINERARY.

MONDAY, Oct. 21. *First Day.*—Leave Boston at 6 P. M., from the Park Square Station of the New York, New Haven & Hartford Railroad in special vestibuled cars. Baggage should be checked to Atlanta. Special baggage tags will be furnished with the tickets, and these inscribed with the owner's name and home address should be attached to every trunk or other piece of baggage. The checks will be taken up on the train by the baggage master of the party, and trunks, etc., thus checked, will be placed in the rooms at the hotel. Hand luggage must be looked after by the owners. At Fall River go on board one of the fine large steamers of the Fall River Line, and leave at 7.40 P. M. for New York; supper and stateroom berth furnished. Orchestral concert in the saloon during the evening.

NOTE: Passengers who find it more convenient to take an all-rail route to New York will be furnished with round-trip tickets, including transfers to New York, at the same place.

TUESDAY, October 21. *Second Day.*—Steamer due in New York at 7 A. M.; breakfast on board the Fall River boat; at 8.10 A. M. transfer by annex steamer to the Station of the Central Railroad of New Jersey, in Jersey City; at 8.30 A. M. leave Jersey City by the Royal Blue Line in a special train composed of elegant vestibuled Pullman palace cars; pass through Philadelphia, Wilmington and Baltimore, and arrive in Washington, D. C., at 1.15 P. M.; transfer to the Ebbitt House, where lunch and dinner will be provided. The afternoon can be disposed of as individuals may prefer. At 7 P. M. transfer from the Ebbitt House to the station, and leave Washington on the special Pullman train at 7.15 P. M. *via* the Southern Railway Company's line.

WEDNESDAY, October 23. *Third Day.*—Arrive at Charlotte, N. C., at 7 A. M., and remain through the forenoon; breakfast and lunch at Charlotte; leave Charlotte at 2 P. M., and passing through the northwestern section of

South Carolina and northeastern Georgia, arrive in Atlanta at 6.30 P. M.; stop at the Kimball House (near the station), Warren Leland, Jr., manager.

THURSDAY, October 24. *Fourth Day.*—In Atlanta.

FRIDAY, October 25, *Fifth Day.*—In Atlanta.

SATURDAY, October 26. *Sixth Day.*—In Atlanta.

SUNDAY, October 27. *Seventh Day.*—In Atlanta.

MONDAY, October 28. *Eighth Day.*—Leave Atlanta at 7.30 A. M. in special Pullman train and proceed over the Southern Railway Company's Chattanooga Line, passing through Rome, Ga., and in full view of the Massachusetts Co-operative Cotton Mill recently erected at that place; arrive in Chattanooga, Tenn., at 12 M.; lunch at the Central Station dining rooms. The afternoon can be disposed of as individuals may prefer. There will be ample time to visit the summit of Lookout Mountain *via* the Chattanooga & Lookout Mountain Railway, from whence a magnificent view is obtained, or by means of street cars or suburban trains, the battlefield of Chickamauga, recently converted into a National Military Park. Leave Chattanooga on special Pullman train at 6 P. M., and proceed over the Southern Railway Company's Bristol Line; dinner on dining-car.

TUESDAY, October 29. *Ninth Day.*—From Bristol northward over the Norfolk & Western Railroad Company's line. Roanoke, Va., will be reached at an early morning hour and thenceforward the ride will be over the picturesque Shenandoah division of the Norfolk & Western Line, passing through the mountain region and down the Shenandoah, through the Great Valley of Virginia which abounds in scenes of romantic and historic interest. Near Harper's Ferry the course turns down the Potomac Valley (*via* the Baltimore & Ohio Railroad), passing directly through the little town made so famous by the exploits of John Brown and subsequent stirring war events, and thence to Washington. From Washington northward *via* the Royal Blue Line, passing through Baltimore, Philadelphia, etc., arriving in New York at 8.40 P. M.; breakfast, lunch and dinner on dining car; ferry transfer from Jersey City to the foot of Liberty Street, New York, and carriage transfer thence to the Grand Central Station, Forty-second Street, from whence sleeping-cars will leave for Boston, Worcester and Providence, passengers being enabled to reach their destinations early in the morning of WEDNESDAY, October 30 (*Tenth Day*).

PRICE OF TICKETS.

From Boston back to Boston	$75.00
From New York back to New York	$65.00

The tickets will include first-class transportation over all the different lines; palace sleeping or drawing-room cars, wherever named in the itinerary (from New York to Atlanta and return, and from New York

eastward to destination); with a double berth—half a section—in the sleeping-cars, all incidental meals on Fall River Line steamer, at hotels, at dining stations, and on dining car; stateroom berth on the Fall River Line steamer, hotel accommodations at the Kimball House, Atlanta, during the sojourn in that city; carriage or omnibus transfers wherever required by the itinerary (in Washington outward and in New York returning); transfer by annex steamer from New York to Jersey City on the outward journey; care of baggage, and services of conductors — in brief, all needed expenses of the entire round trip.

Passengers must return with the party as far as Washington. Transportation tickets will permit of stop-offs at Washington, Baltimore, Philadelphia or New York, but the coupons for Pullman car accommodations north of Washington returning will be good only on the day named thereon (Tuesday, Oct. 29). Sleeping-car coupons reading eastward from New York will be good on subsequent dates.

Members of the Association are permitted to invite relatives and friends to accompany them on the excursion.

Members of the Association who intend to join the excursion party should order tickets for themselves and their guests as early as convenient, sending direct to Messrs. Raymond & Whitcomb, giving names, addresses, and relationship of persons who are to accompany them, and stating also the room accommodations required. In case of withdrawals from any cause, early notice of the same should be given. Tickets must be taken on or before Wednesday, October 16th — five days previous to the date of departure.

Oct. 14, 1895.

The President and Secretary issued the following invitation to Southern cotton manufacturers, through the columns of the Southern press, and those accepting are included in the list of the persons present at the meeting, as far as it was possible to obtain the names:

BOSTON, MASS., Oct. 14, 1895.

To the Southern Cotton Manufacturers:

GENTLEMEN—The fifty-ninth meeting of this Association will be held in the Auditorium, on the grounds of the Cotton Exposition at Atlanta, on Thursday and Friday, October 24th and 25th.

You are cordially invited to attend the sessions and participate in the discussions, trusting that such an affiliation will be of mutual benefit to all interested in cotton production and manufacture.

Yours very truly,

A. M. GOODALE, *President.*

C. J. H. WOODBURY, *Secretary.*

The party, numbering 180, left Boston on Monday, October 21st, at 6.30 P. M., in special cars for Fall River, where the party took the steamer Priscilla for New York.

The menus at the dinner that night and the breakfast the following morning were especially arranged for the party and bore its name and appropriate decorations. Delays on the railroad postponed the arrival of the train at Washington five hours after the scheduled hour, giving merely time for dinner. The next stop was made at Charlotte, N. C., where the party was received by Mr. H. S. CHADWICK, President of the Manufacturers' Club, and a committee of members and leading citizens.

After breakfast at the hotels there was a morning reception at the Manufacturers' Club, after which carriages of the citizens' were in waiting to take members of the party around the city, visiting points of historical interest, the cotton fields, and the following leading industries: the Ada Mills, yarn; the Alpha Mills, yarn; the Atherton Mills, yarn; the Charlotte Mills, yarn and white cloth; the Crowley Mills, towels; the Highland Park Mills, ginghams; the Victor Mills, yarn; the Gold Crown Hosiery Mill, hosiery; O. A. Robbins & Co., sash cord; McFadden Compress; Charlotte Compress; Southern Card Clothing Co., card clothing and leather belting; Charlotte Oil and Fertilizer Co., cotton seed oil, acid chambers, etc.; North Carolina Cotton Oil Co., cotton seed oil, etc.; Cattle Pens of Charlotte Oil and Fertilizer Co., (cattle being fed on cotton seed hulls and cotton seed meal).

After the morning ride, the Association was given a lunch at the Manufacturers' Club, the occasion being graced by the presence of ladies of Charlotte.

After the lunch and just prior to taking departure for the train, President GOODALE made an acknowledgement to the Manufacturers' Club and ladies for their hospitality, to which President H. S. CHADWICK of the Manufacturesr' Club made an appropriate response.

The party left Charlotte early in the afternoon and arrived in Atlanta during the evening.

The opening session of the Association was held at the auditorium in the grounds of the Cotton States and International Exposition on Thursday forenoon, after which there was a reception at the Piedmont Club.

The sessions on Friday morning and afternoon were held in the Council Chamber of the Chamber of Commerce.

On Friday evening the Association and guests were tendered a banquet at the Kimball House, Atlanta, by a joint committee from the Chamber of Commerce, City Council and the Exposition Company, consisting of Mr. H. M. INMAN, Chairman; Mr. M. F. AMOROUS, Secretary; and Messrs. JAMES W. ENGLISH, R. B. BULLOCK, T. B. NEAL and C. A. COLLIER from the Chamber of Commerce; Messrs. W. S. BELL, JOSEPH HIRSCH and N. P. CAMP from the City Council; and Messrs. H. T. INMAN, M. F. AMOROUS, A. J. WEST and W. H. BALDWIN from the Exposition Company.

With Mr. JUNIUS G. OGLESBY in the chair as toastmaster, addresses were made on the part of the hosts by His Honor PORTER KING, Mayor of Atlanta; Col. ALBERT H. COX, representing Governor ATKINSON of Georgia; Captain EVAN P. HOWELL, Col. W. A. HEMPHILL, and Mr. H. H. CABANISS.

Responses were made on the part of the guests by President A. M. GOODALE, Messrs. EBEN S. DRAPER, ARTHUR H. LOWE and JUSTIN A. WARE.

More than two hundred covers were laid, and the menus bore a photogravure of the cotton field of GEORGE W. TRUITT of Troup County, Georgia, which received the State prize of $1,000 for the best crop.

Mrs. Edward C. Peters, corner of Ponce de Leon and Piedmont avenues, gave an afternoon reception to the ladies of the party upon Friday afternoon. The members of the Association also received invitations to the Capital City Club in the city, and the Piedmont Club, at the Exposition Grounds.

On Thursday and Friday the party remained in Atlanta at the sessions of the Association and elsewhere, and on Saturday a portion of the party, numbering fifty-six, of whom ten were ladies, visited Columbus, Georgia, as guests of the city, in response to an invitation extended by His Honor J. J. SLADE, Mayor; F. D. GORDON, Esq., President Columbus Board of Trade; Eagle & Phœnix Mfg. Co., Muscogee Mfg. Co., Swift Mfg. Co., Hamburger Cotton Mills, and Clegg Mfg. Co.

This party was under the charge of Vice-President WILLIAM J. KENT, with Mr. WILLIAM B. HAWES as representative of the secretary, who was obliged to remain with the rest of the Association in Atlanta.

The special train furnished by the courtesy of the Georgia Midland Railroad, left Union Station, Atlanta, at 7.30 A. M., and reached Columbus at 11.15 A. M., stopping on the route at Griffin, where a number of persons joined the party.

At Columbus the party was taken in carriages to the Rankine House where a light lunch was served, and then resuming the carriages the party was conveyed to the following establishments: the Steamboat Landing, being the head of navigation of the Chattahoochee River, on which plies three lines of steamers, carrying freight, passengers and U. S. mail to the Gulf of Mexico; Columbus Iron Works Company; Eagle and Phœnix (cotton) Mfg. Co.; Muscogee (cotton) Mfg. Co.; Clegg (cotton) Mfg. Co.; City Flouring Mills and Elevator; Columbus Railroad Company's power-house, where is generated, by two turbine wheels, the power to operate thirty miles of electric railway in Columbus, Ga., and Phœnix City, Ala.; the North Highlands Casino, commanding a view of three miles of water power; the Golden Ice Factory; the Swift (cotton) Mfg. Co.; the

Brush Electric Light and Power Co.; the Hamburger (cotton) Mfg. Co.; the Georgia Cotton Oil Co.; the Mutual Cotton Oil Co.; the Golden Foundry and Machine Co.

The trip terminated at the Muscogee Club, where an elaborate lunch was served. At the conclusion Mr. J. K. ORR introduced Hon. J. J. SLADE, Mayor, who made an address of welcome, followed by Mr. F. B. GORDON, President of the Board of Trade, and Hon. G. GUNBY GORDON, Rallroad Commissioner of Georgia.

Responses on behalf of the New England Cotton Manufacturers' Association were made by Vice-President WILLIAM J. KENT, Mr. STEPHEN A. KNIGHT and Mr. ABEL T. ATHERTON.

The party on the return arrived at Atlanta at 10 P. M.

The Association received an invitation to visit Augusta, Ga., stopping over on their trip to Atlanta, which was extended by His Honor W. B. YOUNG, Mayor of the city; the Augusta Exchange and Board of Trade by P. B. TOBIN, Esq., President; the Young Men's Business League by HOWARD H. STAFFORD, Esq., Secretary; the Commercial Club by Hon. W. H. BARRETT, Jr., President; Hon. PATRICK WALSH, President *Augusta Chronicle;* JAMES M. JACKSON, Esq., President Augusta Southern Railroad, and GEORGE R. STEARNS, Esq., President Riverside Mills, a member of the Association.

This notable invitation received the most careful consideration by the Board of Government, but the contract for the transportation had already been made and the train schedules prepared, and it was with extreme regret found that it would not be feasible to accept the proffered courtesy as a body.

Hon. GEORGE D. GOULD, Mayor of Nashville, also extended the freedom of that city to the Association and invited them to stop over and receive such courtesies as might be agreeable; but as was the case with Augusta, it did not prove feasible to modify the route so as to pass through Nashville.

The party left Atlanta at 10.25 P. M., October 27th, and arrived at Chattanooga at 6 A. M. the following morning, where they were met at eight o'clock at the Central Depot by Mayor

GEO. W. OCHS, members of the Board of Aldermen, and committees from the Chamber of Commerce and the Young Men's Business League.

After a short response by President GOODALE on behalf of the Cotton Manufacturers' Association and an acceptance of the freedom of the town during the short stay, the members of the Association scattered to the various points of interest about the town, visiting Missionary Ridge and Lookout Mountain principally.

Promptly at 3 P. M. the party left for New York in two sections, and without serious mishap reached their destination promptly on schedule time.

Quite a number of the party availed themselves of the privilege of stopping over in Washington, Philadelphia and New York.

The pleasure of the trip was not marred by illness or accident to any of the party, and the limits of this account do not permit references to innumerable acts of hospitality by individuals, wherever opportunities could be found by the warm-hearted Southerners.

PROCEEDINGS.

In accordance with the foregoing notice, the stated Semi-Annual Meeting of the Association was held at Atlanta, Georgia, on October the 24th and 25th, 1895.

The following were present, including guests and ladies:

M. F. Amorous, Atlanta, Ga.
William Emmett Anderson, Little Rock, Ark.
Benjamin Anthony, New Bedford, Mass.
Mrs. Benjamin Anthony, New Bedford, Mass.
John W. Arrington, Riedsville, Ga.
A. T. Atherton, Pawtucket, R. I.
Mrs. A. T. Atherton, Pawtucket, R. I.
H. C. Atwood, Providence, R. I.
Mrs. H. C. Atwood, Providence, R. I.
George R. Babbitt, Providence, R. I.
Mrs. Charles E. Balch, Manchester, N. H.
W. H. Baldwin, Atlanta, Ga.
L. E. Barnes, Methuen, Mass.
E. N. Bartlett, North Oxford, Mass.
W. S. Bell, Atlanta, Ga.
A. F. Bemis, Boston, Mass.
W. F. Berry, Boston, Mass.
Mrs. W. F. Berry, Boston, Mass.
W. T. Bessonette, Waco, Texas.
J. S. Bigby, Columbus, Ga.
C. H. Botsford, Waco, Texas.
Mrs. C. H. Botsford, Waco, Texas.
S. N. Bourne, Manchester, N. H.
Miss M. Bourne, Manchester, N. H.
H. Bourch, Charlotte, N. C.
A. W. Brainard, Lawrence, Mass.
J. Freeman Brown, Boston, Mass.

Miss S. F. Brown, Boston, Mass.
R. B. Bullock, Atlanta, Ga.
William Burckel, Atlanta, Ga.
W. W. Burgess, Greers, S. C.
J. H. Burghardt, Boston, Mass.
Edward E. Burnham, Boston, Mass.
Eugene E. Burnham, Lawrence, Mass.
James Butterworth, Philadelphia, Pa.
H. H. Cabanniss, Atlanta, Ga.
M. P. Camp, Atlanta, Ga.
Sanford I. Carpenter, Boston, Mass.
H. S. Chadwick, Charlotte, N. C.
C. F. Chandler, Boston, Mass.
E. G. Childs, Bondsville, Mass.
Mrs. E. G. Childs, Bondsville, Mass.
A. T. Clark, Winthrop, Mass.
Jeremiah Clark, Lowell, Mass.
E. N. Clemence, Columbus, Ga.
C. A. Collier, Atlanta, Ga.
F. B. Comins, Providence, R. I.
Herbert Coolidge, Watertown, Mass.
Peter H. Corr, Taunton, Mass.
A. H. Cox, Atlanta, Ga.
A. J. Crompton, Charlotte, N. C.
Randolph Crompton, Worcester, Mass.
George H. Cross, Boston, Mass.
A. J. Currier, Albion, R. I.
T. D. Dallas, Nashville, Tenn.
James F. Davenport, Fall River, Mass.
Charles C. Diman, New Bedford, Mass.
E. P. Dennis, Lowell, Mass.
C. E. W. Dow, Springfield, Mass.
C. A. Dockham, Boston, Mass.
Eben S. Draper, Hopedale, Mass.
George Otis Draper, Hopedale, Mass.
J. M. Dunham, Holyoke, Mass.
William H. Dwelly, Jr., Boston, Mass.
John Eccles, Taftville, Conn.
Mrs. John Eccles, Taftville, Conn.

RICHARD H. EDMONDS, Baltimore, Md.
L. J. ELLIS, New York, N. Y.
JACOB ELSAS, Atlanta, Ga.
F. W. ELY, Greenville, N. H.
Mrs. F. W. ELY, Greenville, N. H.
E. W. EMERSON, Newburyport, Mass.
G. B. EMMONS, Lawrence, Mass.
JAMES W. ENGLISH, Atlanta, Ga.
T. C. ENTWISTLE, Lowell, Mass.
Mrs. T. C. ENTWISTLE, Lowell, Mass.
JAMES E. EUSTABROOKE, Swansea Centre, Mass.
JAMES F. EVANS, Woonsocket, R. I.
D. D. FELTON, Manchester, N. H.
Mrs. D. D. FELTON, Manchester, N. H.
WILLIAM FIRTH, Boston, Mass.
Mrs. WILLIAM FIRTH, Boston, Mass.
Miss PAULINE FIRTH, Boston, Mass.
H. E. FISHER, Atlanta, Ga.
Mrs. S. L. FOGG, Weare, N. H.
ELI FORBES, Clinton, Mass.
J. H. FOSTER, Providence, R. I.
Mrs. J. H. FOSTER, Providence, R. I.
JOSEPH R. FRADD, Manchester, N. H.
GEORGE W. FRYE, Fall River, Mass.
J. W. FUGERSON, Paterson, N. J.
Mrs. J. W. FUGERSON, Paterson, N. J.
C. P. GAITHER, Boston, Mass.
ROYAL W. GATES, Lowell, Mass.
CHAS. E. GETCHELL, Waltham, Mass.
RUFUS D. GOFF, Providence, R. I.
A. M. GOODALE, Boston, Mass.
SUMNER S. GOULD, Lowell, Mass.
GEO. P. GRANT, Jr., Fitchburg, Mass.
Mrs. GEO. P. GRANT, Jr., Fitchburg, Mass.
D. W. GRAY, Utica, N. Y.
STEPHEN GREENE, Boston, Mass.
A. H. GULLIVER, Ashton, R. I.
Mrs. A. H. GULLIVER, Ashton, R. I.
FRANK J. HALE, Newton Upper Falls, Mass.

SAMUEL HALE, La Grange, Ga.
Z. D. HALL, Adams, Mass.
Mrs. Z. D. HALL, Adams, Mass.
Miss EDITH HALL, Adams, Mass.
LOUIS HAMBERGER, Columbus, Ga.
J. F. HANSON, Macom, Ga.
HENRY F. HARRIS, Worcester, Mass.
Mrs. HENRY F. HARRIS, Worcester, Mass.
WILLIAM B. HAWES, Fall River, Mass.
W. A. HEMPHILL, Atlanta, Ga.
S. E. HEYWOOD.
JOSEPH HIRSCH, Atlanta, Ga.
JEROME HILL, St. Louis, Mo.
C. H. HOBBS, Thorndike, Mass.
Mrs. C. H. HOBBS, Thorndike, Mass.
W. T. HODGES, Boston, Mass.
HENRY A. HOLCOMB, New Bedford, Mass.
WILLIAM C. HOLCOMB, New Bedford, Mass.
G. L. HOOPER, Lowell, Mass.
Mrs. G. L. HOOPER, Lowell, Mass.
E. P. HOWELL, Atlanta, Ga.
H. T. INMAN, Atlanta, Ga.
H. M. INMAN, Atlanta, Ga.
E. F. JONES, Manchester, N. H.
Mrs. E. F. JONES, Manchester, N. H.
GEORGE G. KELLY, Lowell, Mass.
ROLAND R. KELLY, Williamstown, Mass.
Mrs. ROLAND R. KELLY, Williamstown, Mass.
W. J. KINCAID, Griffin, Ga.
JOSEPH H. KENDRICK, Providence, R. I.
Mrs. JOSEPH H. KENDRICK, Providence, R. I.
Mrs. J. F. KENNARD, Manchester, N. H.
WILLIAM J. KENT, New Bedford, Mass.
N. B. KERR, New Bedford, Mass.
PORTER KING, Atlanta, Ga.
A. F. KNIGHT, Manchester, N. H.
Mrs. A. F. KNIGHT, Manchester, N. H.
S. A. KNIGHT, Providence, R. I.
WALTER B. KNIGHT, Davisville, R. I.

Miss M. F. Lane, New York, N. Y.
W. H. Lane, Brooklyn, N. Y.
J. M. Lasell, Whitinsville, Mass.
H. Bradford Lewis, Lawrence, Mass.
H. B. Leigh, Charlotte, N. C.
H. B. Lincoln, Worcester, Mass.
A. A. Little, Griffin, Ga.
Arthur H. Lowe, Fitchburg, Mass.
Mrs. Arthur H. Lowe, Fitchburg, Mass.
S. C. Lowe, New Bedford, Mass.
Herbert Lyman, Holyoke, Mass.
O. G. Lynch, Augusta, Ga.
J. R. MacColl, Pawtucket, R. I.
Herbert Magown, Brookline, Mass.
Mrs. Herbert Magoun, Brookline, Mass.
E. O. Marshall, Bank Village, N. H.
George W. McArthur, Biddeford, Me.
John T. Meats, Taunton, Mass.
Mrs. John T. Meats, Taunton, Mass.
H. A. Merrill, Charlotte, N. C.
Fred W. Moore, Millbury, Mass.
Mrs. Fred W. Moore, Millbury, Mass.
A. G. Morton, Griffin, Ga.
J. A. Moyes, Lewiston, Me.
Frank L. Nagle, Boston, Mass.
William C. Nairn, North Cambridge, Mass.
T. B. Neal, Atlanta, Ga.
W. R. Noone, Boston, Mass.
R. M. Oates, Jr., Charlotte, N. C.
J. G. Oglesby, Atlanta, Ga.
William H. Ormerod, Manchester, Eng.
O. L. Owen, Whitinsville, Mass.
Mrs. O. L. Owens, Whitinsville, Mass.
Elmer E. Page, Saco, Me.
S. B. Paine, Boston, Mass.
John H. Parks, St. John, N. B.
Miss Louise Parks, St. John, N. B.
Geo. W. Parrott, Atlanta, Ga.
Mrs. John W. Pead, Lowell, Mass.

J. E. Pearce, Atlanta, Ga.
H. C. Perham, Lowell, Mass.
Mrs. H. C. Perham, Lowell, Mass.
J. C. Platt, Augusta, Ga.
Andrew G. Pierce, Jr., New Bedford, Mass.
Mrs. G. W. Pratt, Lonsdale, R. I.
J. B. Price, Lincolnton, N. C.
J. G. F. Randolph, Boston, Mass.
F. F. Raymond, West Newton, Mass.
Mrs. F. F. Raymond, West Newton, Mass.
T. H. Rennie, Augusta, Ga.
C. O. Richardson, Fitchburg, Mass.
Mrs. C. O. Richardson, Fitchburg, Mass.
Elias L. Rivers, James Island, S. C.
Capt. N. Robertson, Charlotte, N. C.
C. D. Robinson, Crompton, R. I.
J. K. Russell, Vineland, N. J.
J. M. Russell, Worcester, Mass.
Francis E. Saunders, Lowell, Mass.
H. G. Saunders, Atlanta, Ga.
Charles H. Savage, Manville, R. I.
T. B. Seigle, Charlotte, N. C.
Leonard N. Slade, Fall River, Mass.
S. S. Spencer, Lancaster, Pa.
Mrs. S. S. Spencer, Lancaster, Pa.
Joel H. Smith, Augusta, Ga.
Arthur T. Smith, Langley, S. C.
T. H. Smith, Jamestown, N. Y.
Ed. Smith, Charlotte, N. C.
R. P. Snelling, Newton Upper Falls, Mass.
Col. Leroy Springs, Charlotte, N. C.
Geo. W. Stafford, Providence, R. I.
Mrs. Geo. W. Stafford, Providence, R. I.
Walter H. Stearns, Pawtucket, R. I.
W. F. Stiles, Fitchburg, Mass.
M. G. Stone, Pascolet, S. C.
Timothy Sullivan, Fall River, Mass.
A. A. Sweet, Fall River, Mass.
J. O. Sweet, Jewett City, Conn.

W. A. Swift, Columbus, Ga.
Edward Swift, Columbus, Ga.
William Taylor, Tallageda, Ala.
E. W. Thomas, Lowell, Mass.
D. A. Tompkins, Charlotte, N. C.
D. M. Thompson, Providence, R. I.
R. E. Thompson, Fitchburg, Mass.
J. P. Tolman, West Newton, Mass.
Mrs. J. P. Tolman, West Newton, Mass.
Dr. J. D. Turner, Atlanta, Ga.
J. C. Wadleigh, Lowell, Mass.
Herbert E. Walmsley, Newark, N. J.
Justin A. Ware, Worcester, Mass.
Benjamin F. Waterhouse, Centerville, R. I.
Mrs. Benjamin F. Waterhouse, Centerville, R. I.
A. S. Wattles, Canton Junction, Mass.
J. W. Wattles, Canton Junction, Mass.
Geo. W. Weeks, Clinton, Mass.
A. G. West, Atlanta, Ga.
William E. Westall, Lowell, Mass.
H. D. Smith Whaley, Columbia, S. C.
H. D. Wheat, Charlotte, N. C.
Mrs. Alfred Whiting, Oakdale, Mass.
Miss Mary E. Whiting, Oakdale, Mass.
Alfred N. Whiting, Oakdale, Mass.
Mrs. Alfred N. Whiting, Oakdale, Mass.
Alfred W. Whitley, Halifax, Eng.
John H. Whitten, Manchester, N. H.
G. M. Williams, Columbus, Ga.
A. N. Wood, Gaffney, N. C.
Chas. B. Woodruff, Columbus, Ga.
Stewart Woodson, Atlanta, Ga.
C. J. H. Woodbury, Lynn, Mass.
Chas. B. Woodman, Fall River, Mass.
E. Y. Woolley, Boston, Mass.
A. R. Young, Jewett City, Conn.
Chas. F. Young, Lowell, Mass.
Miss F. Young, Lowell, Mass.

MORNING SESSION,

10 A. M., OCTOBER 24, 1895.

The Auditorium of the Cotton States and International Exposition. Meeting called to order. President GOODALE in the chair. Reading of call to meeting omitted, and records accepted without reading.

The PRESIDENT. I declare the Fifty-ninth Regular Meeting of the New England Cotton Manufacturers' Association now in session, and I take great pleasure in presenting to the members of the Association Mayor PORTER KING of Atlanta, who will greet us on behalf of the city of Atlanta.

Mayor KING. *Mr. President, ladies and gentlemen of the New England Cotton Manufacturers' Association:* — I come as the official representative of the city of Atlanta to bid you welcome to a Southern city. We appreciate the fact that the first session of your convention held outside of the Bay State is here in our own city. We appreciate the good feeling which prompted the passage of the act by your Legislature that authorized the holding of your convention under your corporation without the State of Massachusetts. We appreciate further the good feeling that brought you to Georgia and to Atlanta the capital city of Georgia.

I notice in observing the badges worn by your members, the clasped hands, indicative of friendship, the North extending one hand and the South the other. The other day I witnessed upon this stage one of the most dramatic scenes, which meant a great deal, I believe, for both sections of this country when not only

figuratively, but in fact, the right hand of fellowship and brotherly greeting was extended by Governor COFFIN of Connecticut, and accepted by Governor ATKINSON of Georgia.

My friends, we thank you for this tender of your hand, and we accept it in the spirit that it is offered and we welcome you heartily to Georgia and to Atlanta.

We of the South are particularly interested in cotton — in the growth of cotton and in the manufacture of cotton products. Cotton has been for years (or rather was in former years) called king, and it was king, for it ruled us with an iron hand. We now no longer look upon cotton as king, but as a subject which we propose to use for our own benefit and for our own advancement. While of course we shall remain interested in the growth of cotton, in the successful cultivation of it, in the proper use of all its products, the great material development for the future of this country is in the successful manufacture of cotton. We believe that our surroundings, our location — right in the midst of the cotton-belt — our labor cheap, adapted to our own surroundings in every way — a loveable race of people who know nothing of strikes and disagreements — we believe that all these surroundings with our climate are favorable to the manufacture of cotton. Why, sirs, the greatest object lesson to-day, proving what Atlanta's location is as a point for the manufacture of cotton, is the fact that two of our largest mills have within a year doubled their capacity; they would not have done it unless there was a profit in it for them.

We are to-day locating other mills near us. Out on the banks of the Chattahoochee — but a short distance, six or seven miles from our city — are being located the Whittier Mills for the manufacture of cotton. We believe that the future of this country depends upon successful manufacture. We hardly expect, Mr. President and gentlemen, to rob New England of all her manufactures. We know that at least for a season the finer products must be produced there by your own mills, but we believe that the beginning of a new generation, the beginning of

a new era of prosperity to this country, is in the location of cotton mills in the South.

We welcome you, my friends, here. We bid you to see a beautiful city, a city of which we are all proud, which has grown up in the last thirty years. About thirty years ago we had a desolated and scattered population, those who were left numbering only a few thousand. We have now a city of 110,000 people, with buildings, both public and private, of which we are not ashamed; with evidences of growth and prosperity on every hand; with paved streets, electric lights, a good sewerage system, and a public school system, sirs, which we think is not far behind that of any New England city. Provision is made under our public school system for the free education of every child, white or black, within the corporate limits of our city.

In addition to seeing our city, and coming into our homes where we hope to know you, we also invite your attention to our very interesting Exposition which will be seen here on the grounds. One and all, ladies and gentlemen, we bid you welcome to Atlanta.

The PRESIDENT. It is also my privilege to introduce Mr. CHARLES A. COLLIER, President and Director General of the Cotton States and International Exposition.

Mr. CHARLES A. COLLIER. *Gentlemen of the New England Cotton Manufacturers' Association:*—It may appear somewhat ungracious for me to preface what I am going to say to you by an apology. But I feel that it is due, not only to myself, but to the Exposition, that I should make a little explanation. The excitement and dissipation of the last few days, incident upon the visit of the President and his Cabinet and various high officials, State and national, has somewhat disfigured us; and while we are still in the ring, we are in a very battered condition this morning. [Laughter.] I trust, however, that we will regain our accustomed vigor during the day, and that we may be able to make you feel more at home than I fear you feel this morning. The excitement

seems to have reached our janitor, for, to my regret, I find that he is about as late as any of us, and the room is not in the condition that I would like to have had it. I am sure, however, that you will understand the situation and will not consider the temperature of the room as indicative of the welcome which we really have in our hearts.

For myself, personally, and for the Exposition Company, I desire to say that one of the most gratifying of all the incidents connected with this Exposition was the announcement that a body as distinguished as the New England Cotton Manufacturers' Association had thought enough of this Exposition to hold its annual meeting here. We have met and welcomed since this Exposition opened, associations of all characters from all sections of this country; but I can say truthfully for myself that no association has ever come within our gates whose presence is appreciated more by the Exposition Company than the body which you represent. We know something of the power and the influence and the aggregate of the combined capital which you represent, and it is useless for me to say that gentlemen representing as much wealth as I understand you do, are always welcome wherever they go. You are especially welcome in Atlanta. We feel that we have something here worthy of your inspection. We know the reputation that has preceded you — that you are gentlemen thoroughly competent to judge what we have and to appreciate it if it meets with your commendation.

In reference to the Exposition proper I desire simply to say that considering the period during which our work has been accomplished, the condition of affairs when it was undertaken, the depressed condition of the country, we think we ought to be allowed the pardonable pride that we feel in the showing that we have been able to make. You will remember that a little over a year ago this Exposition was first planned. At that time the financial condition of the country was not very gratifying. I believe the most potent reason which actuated the managers of the Exposition in determining on this enterprise was the de-

sire to get the minds of the people off of the condition of the country. The question of panic is a great deal a question of sentiment anyhow. We felt if we could get something to talk about and think about other than the hard times, we would probably pull through without any trouble. That expectation has been gratified. I believe that the city of Atlanta has felt the result of this depression as little as any city in this country. It is not that we have distributed by means of the construction of the Exposition such a great amount of money, but we have given the people something else to think about, and they have forgotten, in a measure, that the times were hard; and for that reason it has been a very great benefit for this section of the country.

There is another matter that I would like you gentlemen, when you have leisure from your business engagements to take in the Exposition, to remember, and that is this: that this Exposition is mainly the result of Atlanta enterprise and Atlanta money. It is true that the United States has made an appropriation for a Government Building and a Government Exhibit. That appropriation was expended by the government. Not one dollar came into our hands and we have had nothing to do with it. Some of the States have also made appropriations for buildings, and some of them are very well represented here in their special buildings. But the money that has gone into the construction of this Exposition was Atlanta money; and I am sure that as appreciative a body of men as you are, when you do have an opportunity to investigate this Exposition, will agree with the general verdict which has been so far rendered — that we have done very well considering the circumstances.

Now there is one other matter that occurs to me before I proceed with what I have prepared formally to submit, and that is, that as I said in the outset, in the multiplicity of engagements and entertainments of all sorts and sizes upon us in the last few days, we are pretty much broken down, but we will endeavor before your session terminates to show you something at least of Southern hospitality and a Southern welcome.

The wonderful advance of the South in the last decade has nothing more marvelous to show than the development of cotton manufacture.

Atlanta had the honor of giving to this movement an impetus the force and value of which are beyond all calculation. Our Cotton Exposition of 1881 stirred the whole South to a livlier appreciation of its possibilities and directed to it the interested view of the civilized world.

As a direct and indirect result of the Exposition we have here the investment of millions of dollars in this section; the settlement of thousands of thrifty citizens, and the enlargement of every industry.

Mr. EDWARD ATKINSON, in a recent article, demonstrated the fact that the influence of the Cotton Exposition in 1881 was felt throughout the civilized world. It was a mark at the opening of a new era in one of the richest regions of the earth. There are to-day in a single Southern city more cotton mills than the entire South had when that Exposition was held.

During the fearful stress of the two years of financial depression through which we have just passed, the cotton mills of the South, in the main, have prospered. There is not one well managed mill in this region — in the region where the cotton plant grows — that does not pay its regular dividends.

We have served notice that the South is not only to be the source of the world's best cotton supply, but that it must wear the double crown of cotton production and cotton manufacture. We do not accept the dictum which concedes to the South unrivaled advantages for the manufacture of the coarser grades of cotton goods, but debars her from competition with New England or old England in the finer grades.

We are in this race for every prize that can be won. We expect to learn much from you men of experience in the higher lines of manufacture; but not more than you will learn from us. All we ask of you is to look about you and we know that your intelligent observation will discern here opportunities which you

will not be slow to accept. You are in better business for yourselves, as well as we, meeting here, than you would be in the White Mountains where you first intended to hold this convention. You are the men we want and we have what you want — nay, what you must have. Whether you buy our cotton and haul it to New England, or whether you come here and manufacture it into the thousand forms of comfort and beauty within the sight of the fields which it glorifies by its growth, you and we have an immense interest in common. Your presence at this great demonstration of the achievements of the South is according to the everlasting fitness of things. This is your country as well as ours; it is our country as well as yours. Not only by the everlasting ties of patriotism which have girdled and strengthened this nation, but by the bonds of mutual interest you and we can seal it with a permanent and indestructible friendship. We, therefore, extend our hands to you in welcome. We make you right royally welcome to our homes, and we challenge you to the closest and most careful investigation of the South as the region which aspires to lead the world in the manufacture as well as the production of the most beautiful crop that blooms and ripens under the kindly kisses of a Southern sun.

Response of President GOODALE: The greeting and the welcome that the Association has received this morning, coming as it does from the mayor of this city and the president of the Exposition Company, is most gratifying. It comes to us after a long journey of twelve hundred miles. Our reasons for coming were several. One was to see the South and the products that are distinctively its own; another was to see the magnificent Exposition which is now in progress, and to see the city capable of conceiving and perfecting such an undertaking. But the most important reason was that we of the Northern States more particularly, might come in contact with the manufacturers of the South. When the Board of Government was considering the question it seemed to us that the ground on which we stood

was ground in common, and that a large number of questions could be presented at the meeting, if held here, which would be of vital interest to you and to ourselves; questions that you and we are studying in order that we may be better fitted for our work. We have brought papers written by men of the South and men of the North, on topics of great interest to us all as manufacturers. They will be presented at this meeting, and the Board of Government is desirous not only that the discussions on these papers should take a wide range, but that they should be participated in not only by the Southern members of the Association, but by the invited guests as well.

Our membership is by no means confined to New England. Our name is of New England, but our membership is only limited by the number of manufacturers in our common country. We have already a large number of members in the South, and we shall not be satisfied until this number is largely increased.

Perhaps the key-note of the meeting will be the present method of ginning and baling cotton and the improvements that are necessary in order to overcome the grievous faults therein. I especially commend to you the paper written by Mr. EDWARD ATKINSON, a long-time member of this Association.

We shall have a description of the Northrop Loom, which is the most important invention of recent years in cotton manufacture.

Mill building in the South will be exhaustively treated, and the growth and advantages of cotton manufacture in the South will be considered by one who has done much to place the South in its true light and to point the way to still further advance.

Our list of topics was never more carefully considered, and they will be presented by men eminent in their respective vocations. Coming as we do to Atlanta for our meeting, breaking away as we have from all traditions of the Association, we feel that we can ask you to come to our meetings and help us to make the occasion a memorable one. We should not be here, this Exposition would not be in progress, were it not for the re-

markable development of cotton manufacture in the South. In 1807 the first cotton mill was started in Maryland; in 1808 in South Carolina; and yet, the progress which has arrested the attention of the world, most certainly that of the North, is practically that of the past fifteen years. In 1880 you had 560,000 spindles and 12,000 looms, in 1894-5 you had 12,500,000 spindles and 55,000 looms, and your consumption of cotton has increased from 47,000,000 pounds to 400,000,000 pounds per annum. Your advantages are numerous. You have your raw material and coal in abundance at your doors; vast fields of iron ore and all facilities for making pig iron, and the great advantage of nearness to the consuming classes. Your labor is abundant, and you do not as yet have the "walking delegate."

Yet we of New England will still stay in business. There is room both for you and for us, and in closer association of the two sections much good may come. In the hope of it we are here to-day, and the welcome we have received both on the way and in this hall, makes us feel that we have done a wise and profitable thing.

Gentlemen, for the Association I thank you most sincerely.

The PRESIDENT. I wish to make an announcement that our meeting to-morrow morning will be held at the Council Chamber of the Chamber of Commerce Building, through the courtesy of Mayor KING. It will commence at ten o'clock.

The following letter from the Georgia Manufacturers' Association was read by the President.

The PRESIDENT. I wish to read this letter which has just come in from the Georgia Manufacturers' Association:

ATLANTA, GA., Oct. 24, 1895.

MR. A. M. GOODALE, *President*,
NEW ENGLAND COTTON MANUFACTURERS' ASSOCIATION,
Dear Sir:

I beg to advise you that the members of the New England Cotton Manufacturers' Association are cordially invited to visit the Georgia

Manufacturers' Building on the Exposition Grounds and to attend and take part in the Convention of the Georgia Association of Manufacturers which will be held in the Auditorium, Thursday and Friday, October 24th and 25th, sessions beginning at 2 o'clock each day.

The Georgia Association of Manufacturers was organized in May last, its purpose being the promotion of the manufacturing interests of the State. The first work of the Association was the erection of its own building on the Exposition Grounds and the exhibit therein, being a comprehensive display of Georgia manufacturers. Some seventy separate exhibits are made in the building, and not an article shown has been manufactured beyond the borders of the State.

By order of

J. T. HANSON, *Pres.*

T. H. MARTIN, *Sec'y.*

The following papers were read:

1. The Present Development of the Northrop Loom.
   Mr. George Otis Draper, Hopedale, Mass.
2. Improvement of Cotton.
   Mr. Edward Atkinson, Boston, Mass.
3. Cloth and Yarn Calculation Simplified.
   Mr. Arnold Schaer, Warren, R. I.

Session adjourned to meet at Council Chamber, Chamber of Commerce Building, corner of Pryor and Hunter Streets, at 10 A. M., October 25th.

MORNING SESSION,

10 A. M., OCTOBER 25, 1895.

Council Chamber, Chamber of Commerce Building. Meeting called to order. President GOODALE in the chair.

The following papers were read:

4. An Improved Method for Preparing Cotton for the Market.
Mr. W. E. ANDERSON, Little Rock, Ark.

5. Improvements in Baling and Handling Cotton.
Mr. D. C. BALL, St. Louis, Mo.

6. Baling and Compressing Cotton.
Mr. JEROME HILL, St. Louis, Mo.

7. Growth and Advantages of Cotton Manufacturing in the South.
Mr. RICHARD H. EDMONDS, Baltimore, Md.

The PRESIDENT. There are some announcements which the Secretary wishes to make before the close of this morning's session.

The SECRETARY. I have not as yet received the invitation for distribution, and, therefore, give verbal notice for the invitation, of the reception to the ladies of the party by Mrs. EDWARD C. PETERS, corner of Ponce de Leon Avenue and Piedmont Avenue from four to six this afternoon.

The banquet by the joint committee of the Chamber of Commerce, the City Government and the Exposition Company will be held this evening at the Kimball House. The invitations are

in preparation, but it is desired by our hosts that no member absent himself because in the haste of preparation for so large a body of guests they may not have received their individual copy. These invitations are not in the nature of tickets of admission. The badge of membership in the Association will be a proper credential for the dinner. Our hosts, the committee, desire to include the guests of the Association in this dinner, but at the present time, on account of the large number present, it is not known whether it will be feasible to extend the tables sufficiently to include them. Full notice will be given at the afternoon session. Should it not prove feasible in this connection I beg to remind the guests that the possibility to necessarily omit our guests from some of the courtesies extended to the Association, was alluded to in the preliminary notice of the Committee on the Fall Meeting. But in this instance, if the guests are not included it will be solely on account of the limitation of room at the table.

The new members are entitled to badges, and by order of the Board of Government, each member of the Association receives one badge, and no one else but members, with the only exception of the President of the Cotton States International Exposition.

The following names are presented to the Association for membership, with the approval of the Board of Government:

ACTIVE MEMBERS.

JOHN W. ARRINGTON, Treasurer and Agent, Edna Cotton Mills, Reidsville, N. C.
By Mr. EVAN ARTHUR LEIGH.

JOHN WALTER ATWOOD, Supt. Wauregan Mills, Wauregan, Conn.
By Mr. J. A. ATWOOD.

PHILIP S. BAKER, Treas. Crowders Mountain Cotton Mills, Kings Mountain, N. C.
By Mr. H. S. CHADWICK.

LEWIS E. BARNES, Supt. Methuen Co., Methuen, Mass.
By Mr. A. F. KNIGHT.

JOSEPH P. BATTLES, Supt. Nonantum Worsted Co., Newton, Mass.
By Mr. J. S. LUDLAM.

ARTHUR F. BRACKETT, Supt. Riverpoint and Arctic Mills, Riverpoint, R. I.
By Mr. J. COLBY LEWIS.

J. W. BROWN, Agent Warren Cotton Mills, West Warren, Mass.
By Mr. C. H. HOBBS.

T. B. DALLAS, Treas. and Gen. Mgr. Phœnix Cotton Mills, Nashville, Tenn., and The Dallas Manufg. Co., Huntsville, Ala.
By Mr. ARTHUR H. LOWE.

F. DILLING, Treas. Dilling Cotton Mills, Kings Mountain, N. C.
By Mr. H. S. CHADWICK.

C. E. FALLS, Treas. Enterprise Manufg. Co., Kings Mountain, N. C.
By Mr. H. S. CHADWICK.

FRANK S. FIELD, Supt. Massaemit Mills, Shattuckville, Mass.
By Mr. C. L. FIELD.

HENRY E. FISHER, Agent Atlanta Cotton Mills, Atlanta, Ga.
By Mr. A. F. KNIGHT.

WILLIAM B. HAWES, Treas. North Dighton Cotton Co., Fall River, Mass.
By Mr. A. M. GOODALE.

GEORGE H. HILLS, Treas. Davol Mills, Fall River, Mass.
By Mr. A. M. GOODALE.

W. T. JORDAN, Mgr. Mountain Island Mfg. Co., Mountain Island, N. C.
By Mr. H. S. CHADWICK.

FRANK E. KALEY, Treas. Morse & Kaley Mfg. Co., Milford, N. H.
By Mr. M. F. FOSTER.

HARRY W. KIMBALL, Supt. Jewett City Mills, Jewett City, Conn.
By Mr. H. L. PRATT.

ELLIOTT COWDIN LAMBERT, Supt. Amoskeag Manufg. Co., Manchester, N. H.
By Mr. C. H. MANNING.

OTIS G. LYNCH, Supt. Enterprise Manufg. Co., Augusta, Ga.
By Mr. M. F. FOSTER.

HERBERT LYMAN, Treas. Hadley Co., Boston, Mass.
By Mr. A. M. GOODALE.

FRED S. MOSHER, Supt. Henrietta Mills, Henrietta, N. C.
By Mr. H. S. CHADWICK.

WM. B. MUNROE, Supt. Millville Manufg. Co., Millville, N. J.
By Mr. J. K. RUSSELL.

ROSCIUS C. NEWELL, Supt. Palmer Mill, Three Rivers, Mass.
By Mr. EDWIN H. BAKER.

JAMES R. PEARCE, Supt. Fulton Cotton Spinning Co., Atlanta, Ga.
By Mr. A. F. KNIGHT.

ARTHUR T. SMITH, Supt. Langley Manufg. Co., Langley, S. C.
By Mr. ARTHUR H. LOWE.

JOEL SMITH, Supt. J. P. King Mills, Augusta, Ga., and Supt. Aiken Mfg. Co., Aiken, S. C.
By Mr. ARTHUR H. LOWE.

LEROY SPRINGS, Pres. Lancaster Cotton Mills, Lancaster, N. C.
By Mr. H. S. CHADWICK.

WALTER F. STILES, Treas. Nockege & Orswell Mills, Fitchburg, Mass.
By Mr. ARTHUR H. LOWE.

O. W. STITES, Supt. for W. C. Plunkett & Sons, Adams, Mass.
By Mr. R. A. GRAY.

D. A. TOMPKINS, Pres. Atherton Cotton Mills, Charlotte, N. C.
By Mr. JOHN ECCLES.

GEORGE E. TUCKER, Agent Otis Co., Ware, Mass.
By Mr. E. H. BAKER.

J. P. WILSON, Treas. Dover Yarn Mills, Charlotte, N. C.
By Mr. H. S. CHADWICK.

ASSOCIATE MEMBERS.

WILLIAM EMMETT ANDERSON, Eng. and Mgr. Standard Circular Cotton Co., Ltd., Little Rock, Ark.
By Mr. S. A. KNIGHT.

D. C. BALL, Pres. American Cotton Bale Improvement Co., St. Louis, Mo.
By Mr. S. A. KNIGHT.

C. H. BOTSFORD, 2nd Vice-Pres. American Cotton Bale Improvement Co., Waco, Texas.
By Mr. S. A. KNIGHT.

EUGENE E. BURNHAM, Leather Belting Mfg., Lawrence, Mass.
By Mr. A. F. KNIGHT.

G. E. EMMONS, Pres. Emmons Loom Harness Co., Lawrence, Mass.
By Mr. A. F. KNIGHT.

H. P. GARLAND, Treas. Loom Picker Co., Biddeford, Me.
By Mr. A. M. GOODALE.

A. WALTER HARRIS, Treas. A. W. Harris Oil Co., Providence, R. I.
By Mr. S. A. KNIGHT.

JOHN H. HAWORTH, of Haworth & Watson, Mfr. Paper Tubes for Textile Manufacture, Lowell, Mass.
By Mr. FREDERICK A. FLATHER.

HENRY A. HOLCOMB, Treas. New Bedford Boiler Co., New Bedford, Mass.
By Mr. WILLIAM J. KENT.

C. H. HUTCHINS, Pres. Knowles Loom Works, Worcester, Mass.
By Mr. S. A. KNIGHT.

STEPHEN C. LOWE, Mill Supplies, New Bedford, Mass.
By Mr. WILLIAM J. KENT.

JOHN M. RUSSELL, Cashier Knowles Loom Works, Worcester, Mass.
By Mr. S. A. KNIGHT.

E. A. SMITH, Pres. Charlotte Supply Co., Charlotte, N. C.
By Mr. H. S. CHADWICK.

LEWIS R. SPEARE, Alden Speare Sons & Co., Oil and Mill Supplies, Boston, Mass.
By Mr. A. F. KNIGHT.

JUSTIN A. WARE, Sec'y and Treas. Crompton Loom Works, Worcester, Mass.
By Mr. ARTHUR H. LOWE.

WALTER S. WATSON, Haworth & Watson, Mfrs. Paper Tubes for Textile Manufacture, Lowell, Mass.
By Mr. FREDERICK A. FLATHER.

The PRESIDENT. I will appoint Mr. JOHN ECCLES and Mr. A. T. GULLIVER a committee to distribute, sort and count the ballots and will ask them to make their report this afternoon.

Mr. A. T. ATHERTON. Has it not been customary in voting for these new members to have the Secretary cast one vote for them all?

The PRESIDENT. Under our Constitution an actual vote of members is necessary.

Before the members leave the room I will say that the afternoon session will begin at quarter past two, Atlanta time, and I will ask the members to remain until after the ballot is taken.

Have all voted who wish? If so, I declare the ballot closed and this meeting will take a recess until quarter past two this afternoon in this room.

AFTERNOON SESSION,

2.15 P. M., OCTOBER 25, 1895.

Council Chamber, Chamber of Commerce Building. Meeting called to order, President GOODALE in the chair.

The PRESIDENT. We will hear the report of the committee on election, read by the Secretary.

The SECRETARY. The committee on election submit this report:

Whole number of ballots cast, 24. All candidates elected.

JOHN ECCLES.
A. H. GULLIVER.

The following papers were read:

8. Cotton Mill Building in the South.
Mr. W. B. SMITH WHALEY, Columbia, S. C.

9. The Unmerchantable Method of Baling American Cotton.
Gen. STEPHEN M. WELD, Boston, Mass.

10. The Cultivation, Picking, Baling and Manufacturing of Cotton from a Southern Standpoint.
Mr. D. A. TOMPKINS, Charlotte, N. C.

11. Some of the Disadvantages Experienced by the Manufacturer through Poor Ginning and Baling of Cotton.
Mr. EDWARD W. THOMAS, Lowell, Mass.

12. The Relations of Employers to Employees.
Mr. HERBERT E. WALMSLEY, Newark, N. J.

13. Sea Island Cotton.
Mr. ELIAS L. RIVERS, James Island, S. C.

The list of Topical Questions was considered by the Association in discussion, either verbal or submitted in writing, except the following, which were passed over without discussion:

33. What is the best method of sizing cotton warps?

46. How can exhaust steam be best utilized in a cotton mill?

47. What is the best method of automatically stopping an engine in case the governor fails to operate?

50. The relative importance of vapor, steam, the aerphor, and the Sturtevant blower system.

54. What is the best method of returning condensed steam to the boilers?

The PRESIDENT. The Secretary has some announcements to make to which I will call your attention.

The SECRETARY. First, I wish to give a badge to any of the new members who may not have received theirs.

The invitations for this evening have arrived, and I would like to distribute them to the members, and would say that I have a few more in my hands, so that members can give them to their personal guests from the North after members have been supplied.

The excursion for Columbus, Ga., leaves to-morrow morning at 7.30.

The PRESIDENT. Mr. H. S. CHADWICK, President of the Southern Manufacturers' Club of Charlotte, desires to say a word.

Mr. H. S. CHADWICK. I ask your indulgence for a moment only. However important this meeting may have seemed to

you, gentlemen, to the Southern manufacturers and to the South industrially considered, it has been pre-eminently important.

I want to call your attention to the fact that you have said a great deal about Charlotte for the last day or so, and if you will pardon me, I will refer to it again. Within a radius of one hundred miles of Charlotte we have the largest cotton mills in the Southern States, both in spindles and capacity and in money invested.

Of course we are all anxious that this most successful meeting should be repeated. And in behalf of the Manufacturers' Club of Charlotte, I extend to you an invitation — to the members of the New England Cotton Manufacturers' Association — to hold a meeting at Charlotte. I understand that the next meeting is already provided for in Boston, and I sincerely trust that this meeting will be repeated in Charlotte at an early day. I assure you that the Club — and I think I can speak for the city as well — will do everything possible to make the meeting a success. [Applause.]

Mr. D. A. TOMPKINS. I wish to second the invitation of Mr. CHADWICK of Charlotte, and as I understand you hold two meetings a year, I trust it may be possible that you will hold your next fall meeting with us. But as the North and the South have been quarrelling for the past fifty years, if we get too thick I don't know what will happen to the rest of the world.

Mr. A. H. LOWE. I think that every member of this Association appreciates this invitation. We know from experience something of the cordiality and hospitality of the people of Charlotte. I move that this question be referred to the Board of Government, and that they make formal reply in response to this invitation.

The PRESIDENT. The motion is carried unanimously.

Mr. E. S. DRAPER. I think that the Manufacturers' Association of New England appreciates very much the courtesies and

attention that have been shown us ever since we started, and as the meeting is about to adjourn, I wish to make a motion that the Board of Government, through its President and Secretary, convey in a formal manner to the various gentlemen and institutions of the South who have shown us this distinguished attention, our thanks in writing, for this courtesy, and that it be prepared in such a way as to appear in our records.

The PRESIDENT. I will ask all in favor of that motion to rise. The vote is unanimous.

The PRESIDENT. If there is no further business I declare this meeting adjourned without date.

Adjourned.

Attest: C. J. H. WOODBURY,

Secretary.

In accordance with the foregoing action by the Association, the following votes were passed by the Board of Government, and official copies transmitted to the various parties who had conferred these attentions on the Association.

The New England Cotton Manufacturers' Association, through its Board of Government, desires to put on record its appreciation of the courtesy and skill shown by Capt. G. B. RYDER, Superintendent of the Southern Railroad in the transportation of the Association from Washington to Atlanta.

The demands on the Southern Railroad made by the Exposition were understood by the Association, and it takes great pleasure in

testifying to the great care and management shown by the officials of the road.

The New England Cotton Manufacturers' Association, through its Board of Government, hereby tenders to the Southern Manufacturers' Club of Charlotte, its most heartfelt thanks for the courtesy shown to the Association on its trip to Atlanta.

The greeting and welcome was so spontaneous and so thoroughly genuine that the Association can only express in a feeble manner its entire appreciation of the same, and to hope that the growth of both organizations will keep pace with the kindly feeling each has for the other.

The New England Cotton Manufacturers' Association is under deep obligations and hereby expresses the same, to the officials of the Cotton States and International Exposition, the City Council and the Chamber of Commerce of Atlanta, for the banquet tendered by them to the Association, October 25, 1895.

It was an occasion that will be long remembered by those of the Association who were present, and the message of good-will and fraternal feeling forming the key-note of the banquet will maintain the harmonious relations here established, and always be a cherished remembrance.

The New England Cotton Manufacturers' Association, through its Board of Government, hereby tenders to CHARLES A. COLLIER, Director General of the Cotton States and International Exposition, its most sincere thanks, first for his cordial invitation to the Association to hold its meeting in Atlanta, and secondly for the warm official welcome given by him to the Association as expressed in the use of the Auditorium and in many other attentions that made our visit so pleasant.

The New England Cotton Manufacturers' Association, through its Board of Government, feels that the warmest thanks of this Association are due, and are hereby tendered to His Honor Mayor PORTER KING, for his courteous and hospitable welcome to the magnificent and progressive city of Atlanta, a city that has shown in the last generation its recovery from ashes and desolation to its present condition of commercial and industrial importance.

The Association further desires to express thanks to his honor the

Mayor, for the use of the City Council Chamber for its meetings, a courtesy most gratefully appreciated by the officers and members.

The New England Cotton Manufacturers' Association, through its Board of Government, desires to express to the Board of Trade and the citizens of Columbus its sincere thanks for the cordial reception it received on the occasion of its visit to your beautiful city, October 26, 1895.

We wish you success in establishing new business in your city and the maintenance of your present prosperity.

TRANSACTIONS.

MORNING SESSION,

10 A. M., OCTOBER 24, 1895.

The Auditorium of the Cotton States and International Exposition. Meeting called to order. President GOODALE in the chair.

The PRESIDENT. The Association will remember that at the last meeting it was decided to have as many as possible of the papers printed in advance, in order that the papers might be presented by title, giving more time for discussion of the same. This will be done in the great majority of cases, but with the first paper on the list, "The Present Development of the Northrop Loom," I shall ask Mr. GEORGE OTIS DRAPER, who will present it, not to cut it short in any way. It is a matter of such vital interest to us all that I shall ask him to read his paper in full, and also that he give us any additional information that has come to light since the paper was written and put in type.

THE PRESENT DEVELOPMENT OF THE NORTHROP LOOM.

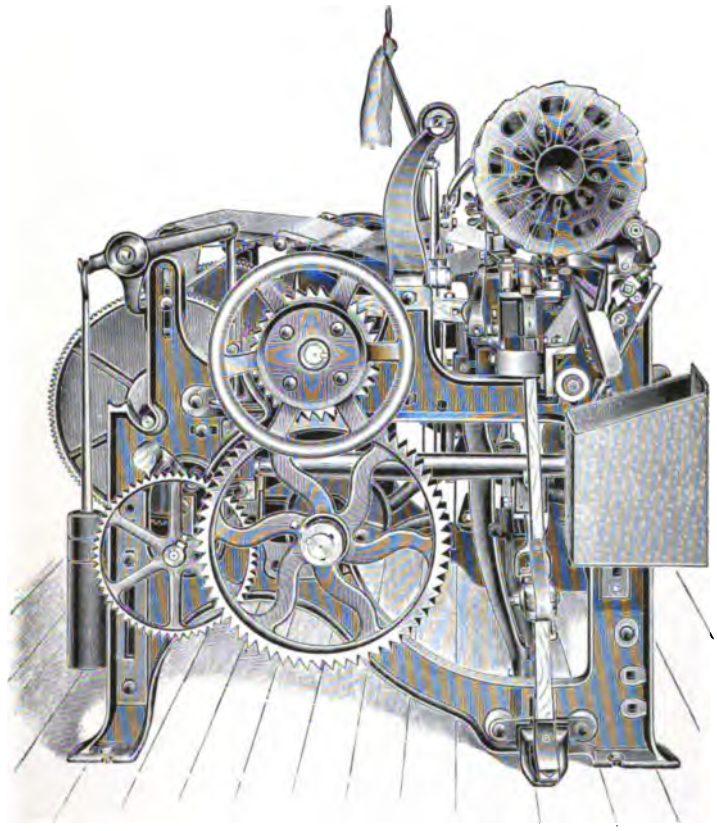
MR. GEORGE OTIS DRAPER, HOPEDALE, MASS.

Ever since the invention of the power loom, the minds of weaving experts have tried to remedy its greatest defect, and replenish the filling automatically. The records show scores of brilliant minds that labored to this end without avail. The result of such experiments in the past has either been despair, or bankruptcy. One of the most prominent English inventors in this line is now an inmate of a poor-house near London. Certain persistent men have at times made single looms run with their devices, but they never stood the test of continuous use, and no public introduction ever resulted.

Looms, therefore, rested while improvements changed the form of other cotton machinery, plain weaving remaining in its elementary stage. No radical change in any vital feature can be shown as the result of the last fifty years. Common looms have certainly been improved in design and detail, and in fancy weaving there has been wonderful progress. The same old principles and defects still hold sway, however.

The Northrop loom is practically an attempt to halve the cost of weaving. To realize what this means, it is necessary to appreciate what the cost of weaving is.

It used to be figured that the weaving department in a mill represented 50 per cent. of the whole labor cost. With the modern improvements in carding and spinning, however, weaving bears a higher proportion. We have seen detailed figures from a representative mill on plain goods where the weaving represented 60 per cent. of the entire labor cost. On many other cloth products it would rank higher. Calling it 50 per cent., however, in order to be safe, it would still amount to $40,000,000 per year in this country, in cotton mills alone, ac-



END VIEW OF NORTHROP LOOM.

cording to present estimate with the census statistics as a basis.

The Northrop loom, therefore, if wholly introduced and successful, would save $20,000,000 per year annually in this country. As the inventions involved are practicable in many cases for woolens, worsteds and silks, it can be seen that there is a possibility of even larger ultimate economy.

This method of figuring might be deemed absurd, did not records show that a real improvement is readily recognized in our mills and rapidly adopted. For instance, we have seen modern high-speed spindles replace practically all old types within a few years. The revolving flat card is also having a rapid introduction, requiring the efforts of five American builders to supply the demand.

With such an object in view, there was ample reason for the large outlay in time and expense that has necessarily been involved. It is nearly seven years now since the definite start of our firm toward this end. During that time we have had the best inventive skill at our command at work, supplemented by draughtsmen, workmen, legal counsel, and the resources of a large and varied machine plant.

To show how thoroughly this matter was gone into, it might be interesting to mention that we had a private agent thoroughly trace every former attempt in this country and abroad.

The results of his investigations have been printed in a book for our private use.

For the benefit of posterity, it may be well to briefly record a few dates and events pertaining to this evolution.

First Year.

February, 1889. First loom ready for trial. (Rhoades Shuttle changer.)

July, 1889. Second device ready for trial. (Northrop Shuttle changer.)

October, 1889. Same loom running in Seaconnet Mill, Fall River. No apparent difficulties.

December, 1889. Twelve similar looms running at Seaconnet. Many apparent difficulties.

Second Year.

January, 1890. Northrop develops new idea, that of changing the filling in the shuttle, rather than the shuttle entire.

May, 1890. Twelve filling changing looms running at Seaconnet. Many improvements needed.

November, 1890. Twelve improved devices replace them. Changes still required.

December, 1890. Twelve further improved changers replace last lot. One weaver runs the whole number.

Third Year.

June, 1891. Fifteen modified devices applied to looms at Pacific Mills, Lawrence.

December, 1891. Twenty-four looms with a different attachment are running.

Fourth Year.

May, 1892. Fifty yet different devices at Pacific Mills.

November, 1892. Hopedale Machine Co. build a loom to attach Northrop device to.

December, 1892. Feasible warp stop motion developed to use in connection with filling changer.

Fifth Year.

August, 1893. Eighty looms ready to run at shop of Hopedale Machine Co., equipped with filling changer of a new pattern, but not yet with warp stop motion.

Sixth Year.

April, 1894. Eighty looms with warp stop motion on, five weavers running same, sixteen looms to each weaver.

June, 1894. Queen City Cotton Co., of Burlington, Vt., enter order for entire mill equipment of this style of loom.

July, 1894. Other large orders received without solicitation.

Seventh Year.

March, 1895. Northrop looms started in the Queen City Cotton Co., at Burlington, Vt.

July, 1895. Queen City Cotton Co. running 792 Northrop looms, averaging sixteen looms per weaver, and paying one-half Fall River prices for weaving.

This record could be enlarged a hundred times without exhausting the facts. Certain parts of the mechanism have been re-invented scores of times, our collection of sample shuttles alone numbering over eighty. The culmination of all this experimenting represents the inventive skill of many minds. About sixty patents have been taken out or applied for, although 600, at least, were necessary, had it been thought expedient to cover every new feature.

In simple terms, these inventions cover a shuttle changing device, a filling hopper from which bobbins or cop spindles containing filling yarn are automatically transferred to the loom shuttle,—a peculiar shuttle which can be threaded automatically by the motion of the loom,—devices that act to stop the loom, or prevent damage in case the shuttle is not in proper position to receive new filling or the hopper is exhausted, and a warp stop motion to prevent the loom from making poor cloth when not watched by the weaver.

There is also an additional feature, for use when the perfection of the goods demands, to prevent a mis-pick. This is called a "feeler" and automatically ejects the filling bobbin or cop just before it is wholly exhausted, never leaving an end in the goods.

As to the former state of the art, there were attempts made to change shuttles automatically as far back as 1840. We believe our patents cover the only feasible methods. The idea of changing the filling in the shuttle and threading automatically is entirely new and so recognized by the patent office.

Dr. Cartwright, the inventor of the power loom, invented a warp stop motion in 1786. Certain forms have since been applied in special cases to coarse warps, but their introduction has never been general. We believe our patents cover the best possible forms, and the only devices practical for general weaving.

The feeler is wholly new, the patent being granted without a reference—a most uncommon event.

The hopper and connected mechanism is the invention of Mr. JAMES H. NORTHROP, whose entire efforts have been given to the work since the start. The shuttle, as at present constructed, combines the inventions of NORTHROP, G. O. DRAPER, J. W. KEELEY, and E. S. STIMPSON. The warp stop motion is credited to Gen. DRAPER and C. F. ROPER. The feeler to G. O. DRAPER and Mr. NORTHROP.

Neither Mr. NORTHROP, Mr. ROPER, or Mr. STIMPSON ever had any practical knowledge of weaving. Mr. NORTHROP had never examined a loom prior to our start, and Mr. ROPER had probably never seen one.

To appreciate what these inventions accomplish, it is necessary to realize the present conditions. On ordinary plain weaving of cotton goods, the filling breaks or is exhausted on an average every five minutes on each loom. Warp threads will average to break perhaps twenty per day per loom. Every time the filling breaks or is exhausted, the loom stops automatically. The shuttle must be taken out, another shuttle put in its place, the loom started, the empty bobbin or cop tube taken out of the discarded shuttle, a new bobbin or cop placed on its spindle, the end of filling sucked through the shuttle eye, and the shuttle placed in a holder. When it is realized that this routine must be observed 960 times per day by a weaver on eight looms, it is evident why the weaver's scope is limited.

Taking the warp into account, when a warp thread breaks, the loom weaves on as usual, making an unsightly defect in the cloth. The weaver is probably busy at another loom, and can not attend to it. On many goods it is the weaver's custom to allow this thread to run until another or several on the same loom breaks so as not to have to stop the loom for each thread. Often a thread thus left broken tangles others, making an overshot, and necessitating a pickout. This takes several minutes of the weaver's time, during which other looms stop or run the chance of making more poor cloth.

The Northrop loom introduces a radical change. The loom

does not stop at all for filling unless its hopper is wholly exhausted. These hoppers carry fourteen bobbins or cops, and the weavers do not let them run out in practice, as they can fill them while the loom is running. It stops instantly for a warp break, preventing any poor cloth, or chance for overshots or pickouts. Instead of stopping 220 times per day, it stops but about twenty. This makes the cloth much better, as every time a loom stops there is a liability for a thin place. The loom is also saved much wear and tear, as stopping and starting is detrimental to many moving parts. The great important saving, however, comes from the reduction of the weaver's duties, and the consequent increase in the number of looms tended. This has been found to result in doubling the weaver's capacity, at least. This can be easily seen possible by the following figures:

Suppose an eight-loom weaver on prints requires half an hour per day to clean, oil, take off cloth, and attend to miscellaneous duties, this leaves nine and a half hours, or 570 minutes. Suppose the loom stops for filling every five minutes, and breaks a warp thread twice per hour. This makes 140 visits of the weaver per loom per day, or 1120 visits on eight looms. $570 \times 60 = 34{,}200$ seconds $\div$ $1120 = 30$.

The weaver, therefore, has a duty each thirty seconds, and has only thirty seconds to allow to each operation of piecing warp or shuttling the loom.

The real state of affairs is much worse than the above appears, as the weaver cannot work to the best advantage, as the looms do not act regularly. All of the looms may run without attention for several minutes, and then several need attention at once, keeping the weaver abnormally busy at intervals. Regular labor is much less exhausting and irritating than intermittent. With a set of Northrop looms, on the contrary, the weaver can work continuously, putting in filling bobbins when the warps are running well, and giving sole attention to warp when necessary. The actual labor on them figures as follows: Taking a weaver on sixteen Northrop looms, allow double time, or one

hour for miscellaneous duties. This leaves nine hours or 540 minutes. Sixteen looms will have 320 warp breaks. At thirty seconds each, the total will take 9600 seconds or 160 minutes. 540—160 leaves 380 minutes to fill hoppers. At five minutes to each cop or bobbin sixteen looms will require 1920 cops or bobbins. Each hopper contains fourteen bobbins, and a hopper can easily be filled in a minute and a half. 1920 bobbins ÷ 14 = 137 hoppers. At one and one-half minutes to a hopper this requires 205½ minutes. 380 — 205½ leaves 174½ minutes unoccupied, or nearly three hours extra time, showing that sixteen Northrop looms require much less time for attendance than eight common.

Figures have been sustained by practice in the present instance, as weavers are running 20 and even 24 looms in regular operation at the present time.

The mill that buys these looms will therefore need less than half the usual force of weavers. As it is a new machine, the help must be given time to learn before expecting the full result.

An old weaver has a great deal to un-learn before he can become proficient. The hardest thing to overcome is the tendency to watch the looms. Their new duties are, however, much simpler, being reduced down to merely placing bobbins in the hoppers and piecing in one warp thread at a time. The hoppers are filled when the looms are running, so the weaver can utilize time to its best advantage.

As weavers are paid by piece work, it is evident that with a great decrease in the labor of producing a cut of cloth must come a proportionate decrease in price paid for weaving the same. There is no reason why weavers should not make more pay at one-half the old price per cut, having lighter duties, practical elimination of weavers' fines, and no sucking-in of filling.

To the manufacturer this means one-half the weaver's cost, or fully one-quarter the entire labor cost in the mill. It is doubtful if all the mill improvements in the last twenty years

Top View
Northrop
Shuttle.

Full
Bobbin.

Empty
Bobbin.

Cop
Skewer.

Steel
Heddle.

Perspective
Northrop
Shuttle.

added together can equal such a saving. In addition, the cloth will be of a much higher standard, with less seconds, on account of the warp stop motion. An increase in production is possible as the looms can be run over-time after the weavers leave at noon and night, gaining at least 10 per cent., if managed properly. The reduction in the number of operatives necessary is quite a point where help or tenements are scarce,—and weavers are usually scarce compared to other help. Many general expense items can be reduced with the reduction of laborers. All these advantages are possible, and the only problem left to the manufacturer is to figure how long he can afford to run his old looms. With a new mill there is no possible question, unless the style of goods demands modifications in the present mechanism not yet designed or invented.

A practical man must consider one feature of a new machine with careful attention. Its complications must not defeat its adaptability. The Northrop loom certainly introduces additional mechanism. This does not add appreciably to the fixer's work, however, as once adjusted, they need little attention. By running one shuttle continuously the labor of setting the pick is largely eliminated, and all know how much time is required for this operation in the usual loom room. The new parts are mechanical, however, and have been well tested. The hopper is placed solidly on the loom frame, and its parts only act when the filling is changed. The rest of the loom is acting from one to two hundred times per minute, so it is evident that wear of the new parts will be proportionally small.

The mechanical operation of the loom is as follows:—

The filling is spun on the regular mule or frame. When frame filling is used the bobbins have a peculiarly shaped base around which are sprung two heavy steel rings. This in no way interferes with spinning, and indeed very appreciably strengthens the bobbin. The weaver takes these bobbins and places them in the notches of a circular hopper attached to the loom breast beam, winding the end of filling around a stud.

When cops are used they are first skewered on a spindle having a base similar to the bobbin base.

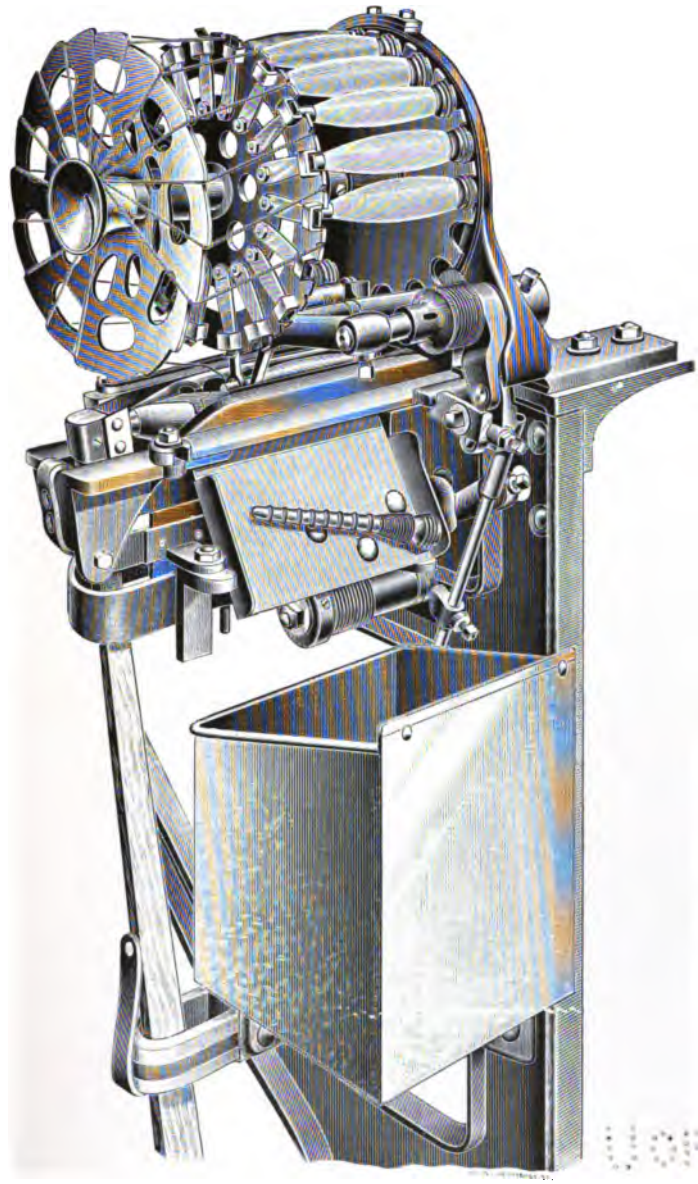
The shuttle in the loom is entirely different from that used with the common loom. It is open from top to bottom. The bobbin or cop spindle is held by grooved springs acting on the rings before mentioned. At the eye end is a very ingenious self-threading eye, adapted to engage and confine the thread.

When the filling breaks or is exhausted in the shuttle, the filling fork detects it. When the fork is not raised, the usual devices, instead of stopping the loom, turn a rod extending under the breast beam. This rod, through a simple connection, raises a notched dog, attached to a pivoted hammer, which in the hopper is positioned above the lowest bobbin. This dog when raised comes in the path of a bunter on the lay, which on the next forward movement pushes the dog, turning the hammer or transferrer, and knocking the bobbin out of the hopper. With the lay thus forward, the shuttle is directly under this bobbin. Through proper guidance, therefore, this bobbin from the hopper enters the shuttle and pushes the spent one out. The latter rolls down an incline into a large metal box.

When the lay turns back, the shuttle is thrown; and the thread, which has one end attached to the bobbin, and the other to the hopper stud, is guided into the shuttle slot simply by reason of its position. This slot is so devised that the thread having entered cannot jump out again.

The rod that turns to make the hopper active also moves a device called a "position-detector," which reaches in front of the shuttle box on the lay, and detects whether the shuttle has rebounded excessively or has not reached "home" properly. In such case the hopper will not act and no damage will ensue.

The filling fork has a cam slide so shaped as to act and stop the loom by un-shipping the shipper-handle in case the fork is called into action several successive times. This ensures the stopping of the loom in case the hopper is empty, the shuttle clogged, or the pick not set right.



DETAIL OF HOPPER MECHANISM.

(OTHER PARTS OF LOOM ERASED.)

Shows fresh bobbin being inserted into shuttle, with empty bobbin falling into box.

The hopper rotates through the action of a coiled spring, which is wound up automatically every time a bobbin is ejected. When a bobbin is transferred, it turns another into position. Should there be bobbins misplaced so as to leave blank spaces, it will make no difference. We have several forms of warp stop motion. The one shown in the cuts is made a part of the harness mechanism. The heddles are made of tempered steel tape. They have slots by which they are suspended, the slots being longer than the width of the supporting bar. In the lower shade, therefore, the heddles will rest on the yarn. When an end breaks its heddle will drop the extra slot length, and interfere with a vibrator controlling the shipper handle. This heddle motion is very neat and effective. It is as easily drawn in as the cotton harness, and from our experience we should judge it would out-wear a dozen cotton harnesses. It automatically spaces itself and thus saves the necessity for buying new harnesses when there is a change in the goods woven. We have so improved it during the years of our experiments, that we consider it the best metal harness ever made, irrespective of its stop motion qualities.

We also have a stop motion for use with the regular cotton harness, consisting of a series of drop wires made of flat tempered stock like the steel harness. These drop wires have control of as many threads as there are harnesses, thus reducing the number to at least less than half the warp threads. This stop motion is so satisfactory we at one time adopted it as a standard for all our looms. The steel harness has been recently improved, however, and is now even better for certain goods.

Taking the rest of the loom in connection with our devices, we have not tried to re-invent except where absolutely necessary. We have certainly found room for improvement, but have not desired to confuse manufacturers with more new schemes than the occasion called for. A loom is a very curious machine in its simplest form, and certain of its motions have that sacred traditional right that one is bound to respect. It will be noticed

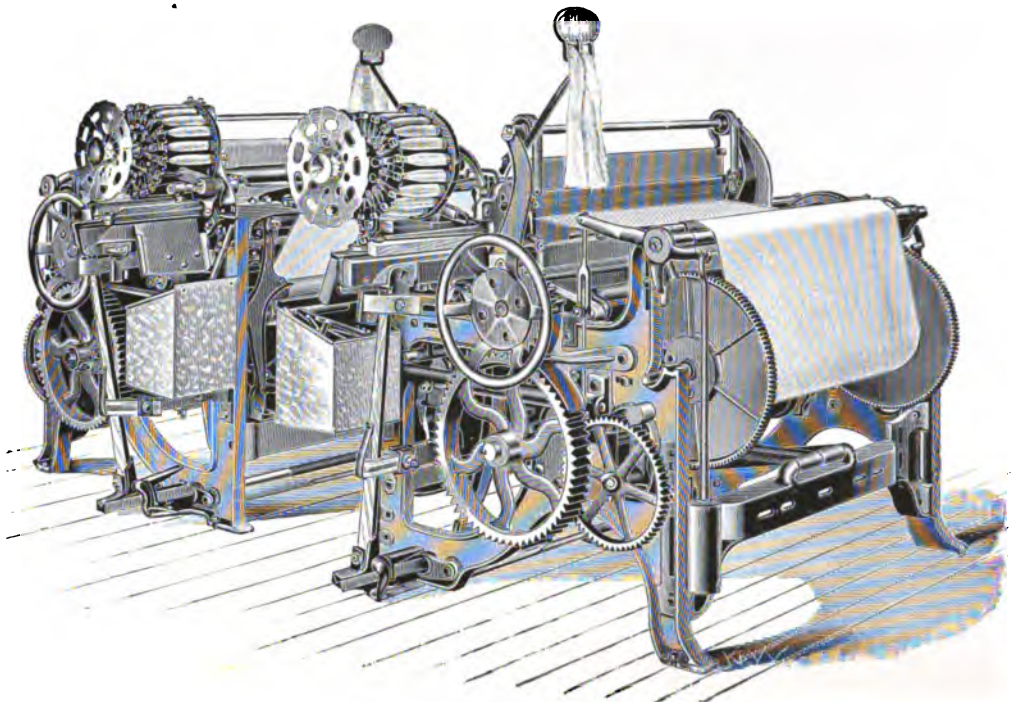
that our attempts in this field are in the direction of adding additional mechanism rather than changing the parts already there.

It may be a matter of interest to know how the introduction of these inventions is being managed.

In the first place, it is extremely doubtful whether they will ever be generally adapted to old looms. It is almost impossible to apply the filling changer to a loom not built for it, and the warp stop motion is of little use without it except on a limited class of goods. We have met this problem by having the Hopedale Machine Co. design and build a loom especially for our attachments. This loom not only meets the desired requirements, but in its general details is extremely satisfactory. It is the heaviest plain loom made in this country, and we know that no expense is spared to make it as perfect as possible.

As to the kind of goods that can be woven, we expect ultimately to use these inventions on every loom that runs one shuttle, and perhaps use some of them on box looms also. We see no necessity for confining ourselves to cotton looms. With such a large field, however, we can only advance by degrees. We took an easy problem at the outset and made plain prints with bobbin filling. At present we see no difficulty in weaving any plain two-harness work with bobbin filling. On cop filling we have run single looms successfully, but wish to experiment on a larger scale before delivering looms for that use. We are in the same position on more than two-shade work, and goods where no mis-pick can be allowed. We have solved the problem on single looms, but are not ready yet to build them in large numbers. In fact, the orders forced upon us for the simplest kind of looms have kept us busy to the full extent of our enlarged works.

In buying patented improvements men like to feel themselves protected. It is discouraging for the early pioneer to find his neighbor buying the same device later on at much lower figures. We are confident that our patents on these loom improvements are strong, and we shall not hesitate to sustain them. We claim



TWO NORTHROP LOOMS.
SHOWN FACING EACH OTHER.

to control the only practical filling changing device known, and the only feasible warp stop motion. We also control the combination of a filling changer and warp stop motion, and the shuttles and bobbins used with these devices. We do not expect to break prices, and trust our past record will tend to establish confidence in our ability to maintain standards of price.

We expect that these looms, at the price we sell them, will return to the manufacturer a profit of from 20 to 100 or more per cent. on the capital invested, according to conditions. Where looms not yet worn out have to be abandoned, the saving is naturally nearer the lower figure. Where new looms are necessary in any event, the extra cost of these devices is alone to be considered. After many years the price of cloth may weaken on account of the lowered price of manufacture, but such a course is not probable until these looms are universally introduced. That will require years inevitably. Those who come first will reap the greatest benefit.

To show the possibilities of the Northrop loom, assume for a basis that a good weaver will average to earn on various kinds of weaving, $450 per year. This is high or low, according to locality. On various goods the labor needed is so proportioned that weavers are given from two to eight looms each. With Northrop looms weavers can tend twice as many and more. The following schedule then shows the saving per loom in wages under the different conditions.

Suppose the weaver to earn $450 per year in any event.

Changing from	2	common to	4	Northrop	saves	$112.50	per loom	per year.
"	"	2	"	" 6	"	"	150.00	"	"
"	"	2	"	" 8	"	"	167.50	"	"
"	"	4	"	" 8	"	"	56.25	"	"
"	"	4	"	" 12	"	"	75.00	"	"
"	"	4	"	" 16	"	"	83.75	"	"
"	"	6	"	" 12	"	"	37.50	"	"
"	"	6	"	" 18	"	"	50.00	"	"
"	"	8	"	" 16	"	"	28.12	"	"
"	"	8	"	" 20	"	"	33.75	"	"
"	"	8	"	" 24	"	"	37.50	"	"

These figures are probably high as it would be advisable to let the weaver earn more on a new machine. It is simply a question as to how the saving is divided. It is there for some one.

From the above table it is evident that the greatest gain is made on goods where weavers are restricted to a small number. It might have seemed wise to try our loom first on such weaves instead of on prints which prevent the least possible chance for gain. Even there, however, the saving is so enormous as to readily excite interest. This can be understood from the following figures:

A print mill of 40,000 spindles and 1,000 Northrop looms could be built and equipped under favorable conditions for $500,000. Such a mill should produce 310,000 cuts per year. A saving of nine cents per cut would show a possible total of $27,900. This is over five per cent. on the whole capital stock of the mill. That is good interest on money, and this is saving that goes on in poor years as well as good, being a constant factor. When a mill can adopt an improvement that only applies to one room and one class of machinery, and then have that device make the whole mill a sure profitable dividend payer, there ought to be little hesitation in its adoption.

We are often asked whether this loom will not cause trouble in the labor market by throwing help out of work. It is evident that were all the old looms to be replaced to-morrow by these new looms, half the weavers would lose their jobs. Such a transition, however, is impossible. With the most favorable condititions possible it will take probably twenty years to replace the old looms, considering the demands from new mills that must also be met. As the cotton industry increases at a strong ratio naturally, such a gradual change as this will hardly be noticed among the weaving class. They will notice the relief from sucking filling however. A weaver on eight common looms stands a chance of inhaling cotton fibre about 1,000 times per day. It is no wonder they are a short lived, consumptive class The introduction of high speed spindles has theoretically re-

duced the necessity for spinners nearly fifty per cent., as spinners tend as many high speed spindles as those of the slower type. No one ever noticed any effect from this diminished need however, ring-spinners being very scarce at the present day.

The need of labor saving machinery was never so marked as at present. Cotton manufacturers in this country have been reasonably protected by tariffs in the past, but they have never before had to meet the competition at present threatening. The successful operation of the new mills in Japan, India and China points to an alarming cheapening in future cloth production. The only way in which we can meet labor costs of eight to twelve cents per day is by the use of machines in which the labor cost is a minor feature.

The present state of loom introduction is as follows:

We have 792 looms running in the Queen City Mill at Burlington, Vt.; 100 at the Pacific Mills, Lawrence, Mass.; 100 at the Merrimack Mills, Lowell, Mass., 48 at the North Grosvenor-Dale Mill, and 287 at the Grosvenor-Dale in Connecticut; 196 at the Social Manufg. Co., Woonsocket, R. I.; 320 at the Tucapau Mills, Wellford, S. C.; 216 at the Lawrence Manufg. Co., Lowell, Mass.

We have also shipped 100 looms to the Cocheco Co., Dover, N. H., and 300 to the new Pelzer Mill at Pelzer, S. C. These looms have not yet been started. We have several sample ooms running in various mills besides the large lots above named.

We have orders ahead for several thousand looms, and could have taken many other orders had we been able to build the looms quick enough. As we are at present doubling our capacity, we shall not be so handicapped in this direction in the future.

There are several very good reasons why I shall not attempt to give details of saving in cost, etc., in these various mills. Such matters are of a private nature, and I shall respect such considerations. The first mill of the lot, however, at Burling-

ton, Vt., being built largely for the purpose of showing what this loom could do, is not among the usual class. We are ready to give definite information as to what is being done there, and visitors are welcome. When first starting looms there, the weavers were of course new to the machines, and they started as low as eight and twelve looms per weaver. They also had small boys to help them keep their hoppers filled, and we had several of our own men there to detect errors in the mechanism and keep reports for our benefit. A few weeks after starting we withdrew our force, and the looms have run since without attention from us. The bobbin boys have also been dispensed with, and the weavers are now running their looms without any assistance. Two weavers are running 24 looms each, and their production ranks with the highest. Eight or ten weavers run 20 looms each, and the whole mill averages over 16 looms per weaver. It would run higher if they were not handicapped in getting good help, and many of their present weavers are new to the machines.

The price per cut throughout the mill is 9 cents. For this same length of cut, the Fall River price is 18 cents. The weavers on 24 looms are earning about $13 per week, which shows that the introduction of this loom has not yet proved disadvantageous to the weaving class. We think this record at the Queen City Mill distinctly shows that our loom requires less than half the attendance of the common loom. Certainly no weaver ever ran 12 common looms. We never heard of a weaver attempting more than 10 common looms, and this only in rare cases. In the best print-cloth mills the average is about 7 looms. We think it very probable from the present rate of improvement that the common loom will be shown to require three times as much attention as ours. At another mill there are weavers running 16 40-inch looms each, where they formerly ran 4 to 5 common looms on the same class of work.

The cloth produced at the Queen City Mill is sold on the market, and we think it ranks with the best cloth woven in this

country. From the variety of goods that we have seen woven, we should judge that any two-harness weave can be produced on our present loom.

We have as yet only introduced looms for use with bobbin filling, but we are at present making extensive experiments with a view to selling looms for cop filling. There are many looms in use where our filling changer cannot be applied, as they run drop boxes. We have, however, had our warp stop motion attached to such looms with very gratifying results; and there is a large mill at present engaged in changing over large numbers of their drop-box looms for this warp-stop motion.

So far as we are aware, our looms are doing everything we have claimed for them. We have never assumed to guarantee that weavers would run any stated number of looms. What we have done is to show that we could find weavers that could run 16 or more looms, and we would agree to furnish the mill with that same machine in duplicate. We do stand behind the looms as mechanical structures, and as before stated, we believe our looms are, mechanically, operating everywhere as guaranteed. It is true that certain mills are making better showings than certain others with this device. That will always be the case, as human nature varies in capacity.

While it may be asserted that the Queen City Mill has had the advantage, or disadvantage, of some personal supervision from our firm, we can also state that another mill, which none of us have ever seen, is producing cloth with these looms at lower cost for weaving even than at Burlington.

Such is the record of the Northrop loom after six months' introduction to the public. Facts so easily investigated cannot be reasonably doubted or explained away.

If the future results are even one-half what we prophesy, this loom will still rank as the most important of the textile inventions of the century. It is just one hundred years since the introduction of Whitney's cotton gin, and we know of no one improvement since that time that has shown one-half the possi-

bilities that this loom promises. It has fully passed the experimental stage, although there will doubtless be minor modifications in the future. Those who wait for the modifications, however, are probably playing a losing game. Its introduction is so secure that nothing now can possibly kill it but the development of a still more remarkable weaving machine. As to that possibility, we can only judge by past experience. It has taken more than a hundred years to evolve the Northrop loom as distinct from the old power loom of Cartwright. What will naturally be expected of the future?

A lecture on a mechanical structure must of necessity be dry and uninteresting. The action of the machine itself, however, is always interesting to thinking men, and we would strongly recommend you all to see this loom running at our exhibit in the Machinery Building. There its action can be studied and the results appreciated.

Mr. JOHN ECCLES. I would like to ask Mr. DRAPER to designate how the looms are cleaned. He has given us the number of looms a weaver can operate; I would like to know if there would not be more work put upon the weaver in cleaning these looms.

Mr. GEORGE OTIS DRAPER. I will tell you all I know about that. At the Queen City Mills the looms are cleaned by a force of five small boys, who are hired for that purpose and who also attend to the oiling of the looms. That is the only mill that I know of where the weavers have any assistance in cleaning or oiling.

Mr. JOHN ECCLES. I would like to ask, where one operator runs so many looms, if there would not be more work about those looms for a fixer?

Mr. GEORGE OTIS DRAPER. The Queen City Mills fixers were started at eighty looms each. Of course you will remember that this loom is entirely new to the men who were to run

it, and naturally it takes some time to get acquainted with it. I think it is very likely that the number will be increased, but for the present I would advise having a fixer for not more than 100 looms. This loom has only been running six months and we cannot tell yet how they will be worked.

Mr. JUSTIN A. WARE. I would like to ask what mills are operating looms with a device to save the pick?

Mr. GEORGE OTIS DRAPER. We are simply using them on experimental looms just to show what we could do. We have so many orders on hand for plain looms we do not care to get out another device until we feel it is called for. However, I think there is no question about its future use.

The PRESIDENT. We have with us Mr. EBEN S. DRAPER, and I know you would be glad to hear from him in connection with the Northrop loom.

Mr. EBEN S. DRAPER. This is entirely unexpected to me. I had not the slightest idea that I would be called on to say a word. I had listened with a great deal of interest to the paper that my partner read; I say a great deal of interest, because I confess that the Northrop loom has not ceased to be an interesting subject to me, and I hope never will. I will, however, in answer to Mr. ECCLES, state that I believe these looms will always have to have special attention in cleaning and oiling. I believe that if a weaver runs from 16 to 20 looms, the cleaning and oiling of those looms would be better done by another person. It would be a great deal better for the manufacturer himself to have special help, which they can get, well trained and well adapted for this class of work, to do that for them, and I think it ought to be done. I am recommending their having it done by separate help. But as far as putting the bobbins in the hoppers or in any other work, I do not think it is necessary for the weaver to have help in any way, shape or manner. I have been through all the mills where these looms are used with the exception of the Tuckapau mills. I have been in the weave rooms

and watched them carefully and shall be very glad to answer any question or to meet any criticism that any of you gentlemen would like to ask or make about the loom. I know that there are many men here who are interested in it from various standpoints. We do not propose to claim anything for this device that we cannot substantiate in practical operation. If any one would like to ask a question about the practical working of the loom I should be extremely glad to hear from them, because I think I can meet any questions that any one would care to ask, or any criticism that they would like to make. We do not claim that the machine is perfect; we believe that it is to be improved in the future; but we do claim that it is practical and successful and that it can be run by the manufacturers at a great saving.

The PRESIDENT. We are fortunate in having in Vice-President KENT a director of the Queen City Mills. Mr. DRAPER was reluctant to give us any inside facts; possibly Mr. KENT will be willing to do so.

Mr. WILLIAM J. KENT. The President has told you I was a director of the Queen City Mills. I wish to state that I had nothing whatever to do with the construction of the mill; I merely signed my name as a stock-holder and was voted a director. I have, however, had a chance to criticise, which I have done, and have also had a limited opportunity to watch the work of the Northrop looms that are sold by the firm of George Draper & Sons, and I do not think it needs any advertising beyond that which they are able to give it themselves, but I wish to state they are not telling you one-quarter of what the loom is capable of doing. I have been trying for a long time to get my people to let me put in a number of these looms and as soon as they consent I shall not want the firm of George Draper & Sons to tell us how to run them; if they will build the loom right I think we can operate it successfully. I think my friend Mr. WHEAT, who, I understand, is putting in a lot of these looms, will show your people of the South and some of

us at the North, that there can be no more production gotten out of the looms than is now being done at the Queen City Mills. They are doing very nicely with the looms, progressing rapidly and improving every day. You know there is always some one who has got to take the lead. I like to be in the first rank; if I am in a procession I want to ride in the first hack, or as near the first as I can get. I hope before long to be able to tell you more about the working of this loom. I am watching it very carefully and know that those of you who have the good fortune to have any of them will be glad you have, and I want to say further to those of you who linger towards the last that you don't miss everything. They are improving on this loom every day and in the course of a year or two you will be surprised at the results that will be obtained from the Northrop loom.

The PRESIDENT. I think, gentlemen, that there will be no more important question before the Association than the present one, and hope you will ask any questions that come to you.

Mr. ARTHUR H. LOWE. I would like to ask, what is your opinion of the way of applying this drop operation to revolving boxes?

Mr. EBEN S. DRAPER. I would say in answer to that that as far as the principle is concerned, the filling chamber has not been applied, nor can it be applied at present to the drop box loom. I will also say that two of the most prominent loom manufacturers in this country have made us an offer to pay all expenses necessary if we would give them the right to adapt it. That shows how they feel about it. In regard to the warp stop motion, however, it has been applied to drop box looms, and I will also say — I would not mention the name of the firm for the world, but will say that they have made a contract for five thousand looms, and you can come pretty near guessing who it is. I would also say in that respect that we have been asked by a great many concerns to apply the stop

motion to the loom having the drop boxes, and we have agreed to do it for at least 12 or 14, just as soon as we can get ready, and I will ask the President to verify that statement.

Mr. JOHN ECCLES. About how many ends on a number of yarn would this loom be adapted to — the number of yarn per end?

Mr. EBEN S. DRAPER. I will say that we are weaving Masonville sheetings; these are 92 by 88, as I understand it. It is the closest woven sheeting that I know of made in New England. Now at the same mill we are weaving goods made of 50 warp and 40 filling, and there are only 52 picks. It happens that in the same concern we are getting a range of from 90 to 52 picks. We have also woven some very coarse goods where there are only about from 30 to 40 picks.

Mr JAMES O. SWEET. I would like to ask if you have used the loom in the manufacture of three and four and five or more harness goods?

Mr. EBEN S. DRAPER. I will say that as far as the firm of George Draper & Sons is concerned we have not reached it. I went in the mills of the Social Manufacturing Company the other day, and they are running one loom on three harness goods, and they are doing it without the slightest difficulty.

Mr. GEORGE OTIS DRAPER. I would like to mention that this was just an experiment.

Mr. ARTHUR H. GULLIVER. I would like to ask whether you would not recommend, in regard to cleaning and oiling these looms, the employment of an especial class of help? It seems to me that there is damage done by indiscriminate oiling. I do not believe that one-fourth of the oil that is put on the loom gets to the bearing; three-fourths of it gets on the floor and on the loom. It seems to me that this is the point that ought really to be taken into consideration with such a loom as the Northrop loom, which is more complicated than the plain loom. Would it not be better that the oiling should be put in competent hands?

Mr. EBEN S. DRAPER. I should have answered that question

with perfect frankness except that Mr. KENT stated that they did not want George Draper & Sons to run their mill. I think that the manufacturers when they get these looms in will very soon find out how to run them much better than we can tell them. If I was advising a man in putting in these looms, I should distinctly tell him to have a special man or boy, some one person picked out because they are careful, to do the cleaning and oiling. I would like to say that I do not think the complications in the oiling necessitate it. I think it is a more complicated machine than a common loom, but not in its complications as to oiling. But to answer this question directly, as far as we are concerned, we should recommend in putting in this loom, having a special man to do this.

Mr. ARTHUR H. GULLIVER. I do not mean that there are more places to be oiled; but the places that are necessary should be oiled. There is one more question I would like to ask which is in touch. You referred to the experiment with a device to save the picker; I will inquire if in these experiments you found it necessary to reduce the speed in order to have the apparatus work successfully?

Mr. GEORGE OTIS DRAPER. I will say that nothing as we have yet found will limit the speed in any way. We, none of us, believe in very high speed for the looms. We would much rather run the loom at 180 than 200; but in the experiments we have not had to reduce the speed in any way to favor these devices.

Mr. R. M. OATES, JR. A gentleman, not a member of this Association, has asked this question, whether repairs after, say five years, would be greater on this than a plain loom.

Mr. EBEN S. DRAPER. In answer to that question I should say, in my opinion, distinctly, yes; there are more parts to the Northrop loom, considerably more. I do not think it would be an exhibition of sense for a man to stand up before a body of gentlemen of your intelligence and say that a loom that had a great deal more machinery about it would need less repairs.

But, on the other hand, those things are in our opinion comparatively trivial to the great saving there is in the matter of cost of manufacture. I think the cost will be very much less on the Northrop loom where the steel harness is used. The steel harness will last a long time, but I don't know how long. After running two years it is a good deal better than when new.

The PRESIDENT. If there are no further questions we will take up the next paper on the list by Mr. EDWARD ATKINSON, who, unfortunately, is not in attendance. The Secretary will therefore read this paper.

IMPROVEMENT OF COTTON.

MR. EDWARD ATKINSON, BOSTON, MASS.

I have been asked to deal at this meeting with the prospective improvement of the cotton fibre. Since many of our southern friends may be present, while all may be interested, I shall not hesitate to make a resume of several treatises that I have previously written upon this subject, some of which have been presented to the Association while others were prepared when I was quite alone in this line of research among the New England cotton manufacturers. I have always posed as the theorist among you thereby anticipating your criticism and causing you to say to yourselves almost "unbeknowst" like, "Well, after all, if he is not a practical spinner he may know a little something

about cotton and perhaps we had better listen to him." Now, what sensible man would ever employ a physician whose study of the theory had not preceded the practice of the medical profession, or a lawyer whose study of the theory had not preceded the practice of law? That idea is as applicable to the unprofessional practices of the cotton grower and manufacturer as it is to theory and practice in the learned professions. The only difference is that we practical men are forced to learn our lesson empirically and to improve on our own mistakes because no true study of the theory of cotton growing, cotton ginning, cotton baling, cotton spinning, or cotton manufacturing as a whole, has so far preceded the practice in these arts as to govern them. Hence I find myself even at this stage of the industry, which is only a century old with us since the invention of the cotton gin, called upon to address a great body of men practicing an art which is full of faults and bad methods from the beginning to the end, especially at the beginning or southern end of the process.

In proof of this the evidence of experts so far as I have been able to secure it is to the effect that the result of our maltreatment of the cotton fibre on the way from the field to the finished cloth, is to deprive the fibre of about seventy-five per cent. of its initial strength. I again call your attention to Dr. F. H. BOWMAN'S work upon the cotton fibre in which this subject is treated very fully. If that be true, then I submit that we are all a set of quacks and that we don't know the true theory of our own business. But there is another side to this and that is as you all know so well, the whole margin of profit in all our modern arts consists in saving the waste of the older methods, or else in saving the waste of the present time that the next man is making who has not yet mastered the theory of his own branch of industry. If that is true, then what a lucky set of men we are to have a margin of seventy-five per cent. of previous waste from which to work out our own profits by saving a part of it each in our own cotton factories. Yet more, if that again be

true what a more lucky set our southern friends are, because of all the bad and wasteful practices which now prevail in our work the very worst are to be found in the treatment of the cotton fibre from the field to the factory. I should have to search the dictionary for words of a sufficiently comprehensive kind to give a true impression of the maltreatment of the cotton fibre before we get it into our mill yards. In fact, the biggest part of our own bad practices are made necessary in order to overcome the evil work of our southern friends in the field, the gin house and the compress.

I think I see some of my northern friends shivering lest these hard words should give offence, but my friends in Atlanta are used to me and ever since I contrasted their old bad practices with the vision of their future in their own senate chamber in 1880, I think the more I "sass" them, to use a Yankee phrase, the better they like me.

Now if we are to deal with the theory of cotton we must begin at the beginning, as I did nearly forty years ago. I treated it in a pamphlet entitled "Cheap Cotton by Free Labor," from which I will venture to give you one of my forecasts.

Bearing in mind that at that time some of our principal cotton manufacturers put woolen machinery in their yards for fear they should never get cotton enough to run them again and comparing that condition with last year, perhaps you will justify the theorist of 1861. I will not give the extract in full of my dealing with the cotton seed in 1861, as it would occupy too much space. A condensed statement which so far as it is given is in the same words then used is as follows:

"Under slave cultivation cotton land is rapidly exhausted, but under free cultivation the case will be far different. While the fibre of cotton contains scarcely any elements drawn from the soil, for each pound of clean fibre there are two or three pounds of seed largely composed of elements drawn from the soil and it is by the waste of the seed that the land is exhausted.

"100 parts of fibre will yield 0.9347 per cent. ash, composed as follows:

Carbonate of potassa, with a trace of soda,	44.29
Phosphate of lime, with a trace of magnesia,	25.34
Carbonate of lime,	8.97
Carbonate of magnesia,	6.75
Silica,	4.12
Sulphate of potassa,	2.90
Alumina,	1.40
Chloride of potassium, Chloride of magnesium, Sulphate of lime, Phosphate of potassa, and loss,	6.23
Oxide of iron, (a trace),	
	100.00

"100 parts of seed will yield 3.936 per cent. of ash, composed as follows:

Phosphate of lime, with trace of magnesia,	61.34
Phosphate of potassa,	31.73
Sulphate of potassa,	2.65
Silica,	1.68
Carbonate of lime,	.47
Carbonate of magnesia,	.27
Chloride of potassium,	.25
Carbonate of potassa, Sulphate of lime, Sulphate of magnesia, Alumina, and oxides of iron and manganese, and loss,	1.61
	100.00

"Now as there are at the least estimate, 250 parts of seed (by some authorities 300) to 100 parts of fibre and since there are about four times the mineral elements in the seed that there are in the fibre, it follows that the seed exhausts the soil at least ten times more than the fibre.

"Under the slave system the surplus seed is used for manure,

but in such a rude and wasteful manner that most of its value is lost, being upon a plan much like manuring a cornfield by burying whole corn in the hills.

"Each hundred pounds of seed will yield 50 pounds of shell and about 50 pounds of kernel; the kernel will give 12 1-2 pounds of oil, equal to 1 2-3 gallons, and 37 1-2 pounds of oil cake; the value of the crude oil is now 50 cents per gallon, of the oil cake, $25 per ton.

"The cake is admirable food for cattle and by English analysis, the value of the manure made by stock fed upon it is greater than that from any other food.

It may be here remarked that the saving of the cotton seed of Egypt had even then been developed, the cotton seed oil was then used to adulterate olive oil (or rather to mix with it because it does not make an adulteration in the offensive sense) and the cotton seed meal was very largely used as food for stock in England."

My treatise continued in the following words:

"By the northern farmer this meal would be fed to stock upon the farm and by the use of the manure the cotton field might be made more productive instead of being exhausted. The want of pasture (which exists in many of the cotton States but not in Texas), might be supplied by sowing corn for fodder, and feeding stock in the yard.

"It may be useless to urge the saving and use of manure upon the rich bottom lands of the south for some years to come, but the free farmer would utilize the seed for its commercial value only.

"Taking the estimated product of one acre of Texas cotton land:

500 lbs. of clean cotton at 10 cents,	$50.00
1,200 lbs. of seed yielding 600 lbs. of kernel, giving 20 gallons crude oil, at 50 cents,	10.00
450 lbs. oil cake, at 1¼ cents,	5.62
Total,	$65.62"

I then gave a list of the articles which could be made from the cotton seed oil. A little later I turned the attention of my readers to the value of the cotton seed hulls for the production of alkalies and yet a little later recommended grinding the hulls with the meal after the oil had been extracted in order to extend the quantity and make a more complete and wholesome food for stock of any kind. In my pamphlet of 1861 I also gave another analysis of the cotton seed of the Sea Island crop, the black seed cotton which corresponds very closely to the analysis of the seed of the Egyptian cotton.

Such was my theory about cotton seed in 1861. You will witness the practice of the present on these lines in the wonderful exhibit of the products of the cotton seed oil industry of to-day.

Let me now develop the theory of the cotton plant in its relation to the cotton fibre. The theory of all plant life is developed in the practice of the plants in the production and distribution of the seed. The manufacture of seed is the objective point of the cotton plant. How does it do it and how can we aid the cotton plant in doing this work to our own profit? The fibre is the wing of the seed by means of which it winged its way from its origin in Mexico. It found a place prepared for it upon the soil of our southland. That soil has never been subjected to the glacial ice cap which ended its course near the mouth of the Delaware; it consists of the disintegrated rocks of the great Laurentian chain of mountains, the great back bone of our eastern section; these rocks are full of the elements of fertility; this soil worked out by the erosion of the streams which were formed by the deposition of the moisture brought in from the gulf stream upon the mountains and there condensed, was washed down into the huge gulfs and bays which penetrated nearly to the Ohio River on the west where the current of the gulf stream brought in the luxuriant plant growth of the tropic oceans with the bones and teeth of animals from the Amazon and of fishes that are now found in the beds

of phosphates. On the east the streams from the mountains met great bays which reached the very foot of the hills. By the mingling of these elements the cotton soil was formed so as to be capable of yielding up the forty or fifty pounds of phosphates of lime and potash which are found in the seed from which each bale of cotton fibre is derived, while the fibre in the bale contains only four parts the principal part being carbon derived from the atmosphere. The waste of former days began with the waste of these properties of the soil and with the waste of the seed from the saving of which the new wealth of the renewed southland is now being richly derived. On this saving may you not predicate yet greater progress? In 1861 — nay, even in 1880 — this source of wealth was almost wholly the vision of the theorist. True, some few men of science had begun their investigations, but it needed the "duffer" to enter in where science feared to tread in order to force the attention of your practical men to these matters — that is my principal function. I must repeat one good story of one of your southern scientists: he was working in his laboratory in Charleston, in 1861, on the recently discovered phosphate beds when some one brought in the ordinance of secession. "Bah," said he, "that is not what South Carolina needs — she needs manure!" May I venture to hint to any of my friends from South Carolina if any are here, that they need another kind of fertilizer just now. If they will put some of the populist and cheap money crazes under the soil they may reap a crop of prosperity equal to that of their neighbors a little further south.

Now let us go back to our theory of the cotton fibre. Even the treasures of nitrogen, lime and phosphate which the ages had imparted to your southern land may be exhausted by ignorance and waste. The soil is not a mine which cannot be worked out; it is a laboratory in which the product will be in ratio to the intelligence and skill with which it is worked.

Much of your cotton fibre is short, poor, tender and uneven because your labor is not yet under intelligent direction and

your land has been scathed by bad cultivation. You possess the most wonderful abundance and variety of the leguminous plants, — cow-peas, peanuts, beans, clover, alfalfa, etc., — on which the bacteria live and multiply in myriads, drawing nitrogen from the air, heretofore the most expensive and the most necessary fertilizer of the cotton field. All you have to do to renovate your exhausted lands is to find out what ash element is needed — phosphate at your doors, potash, lime, or whatever each soil may need to develop the growth of your pea vines so as to secure nitrogen without cost, then feed them or turn them under and renew your cotton lands. How intelligently and how widely is this being done? You know better than I do.

But it does not serve to nourish the soil only — another branch of nutrition comes into the theory of the cotton plant. You must nourish the fibre of the brain.

How fully are you sustaining your schools, black as well as white, to the development of common intelligence which must be commensurate with the common opportunity now so widely open to all? In the common school will be found the true development of the cotton fibre — in the mental fibre is the basis of all the material fibres and fabrics on which we exist. In mental capacity and force lies the secret of high and adequate wages coupled with low cost of production.

Compare Massachusetts and Georgia. Wherein is the difference? I am not here to sound the praises of my native State; let her works speak for her — if she is not justified by them no mere words may be of any avail. What has made her what she is? With more than one-fourth of her people foreign born — more than one-half either foreign born or of foreign parentage — from what source has she derived her wealth so that but one element of it, the deposits in her trust savings banks, amounts to more than $400,000,000? To whom does this belong? Nearly every other man, woman and child in the State — over one million in number — owns a part of this deposit, exceeding four hundred dollars ($400) each on the average. Whence

came it? From what resources was it derived? We possess no natural resources — no iron, no coal, no timber left, no cotton, no wheat; we have but a few strips of land in the valleys of our rivers which are fit for farming. Is it true that the individual wealth and the common welfare of the people are in inverse proportion to the natural resources or products of a State? Sometimes I think that paradox contains the true principle of progress.

When President GRANT came to Massachusetts to take part in the celebration of the centennial of the Battle of Lexington on the 19th of April, 1876, it had been agreed by himself and the officials who came with him that neither should speak in public. The merchants of Boston gave him a dinner over which the late ALEXANDER H. RICE presided. When Governor RICE proposed the health of the President he made the customary reference to our two principal products, granite and ice, as the only ones in which we could claim eminence. When he sat down President GRANT turned to him and said, "That was a good speech, Governor, but you omitted the chief product of your State." "What is that?" asked the Governor in some surprise. "Men," replied the President. That was his only speech on that day. What then is the secret of the wealth and welfare of our State in which you may emulate us? We make our profit out of the waste of other States. When commerce was our main resource our ships carried the flag of the Union to the remotest sea, through storm and ice and from the tropic seas we gathered the materials of our industry — we sent our ice to Calcutta and brought back the crude products of the Indies to be converted into goods and wares for the supply of our own cotton growers. When the policy of developing yet more rapidly our textile manufactures already well established, was forced upon us by high duties under the lead of Calhoun, Webster resisted the measure, pointing out that the single county of Essex, where old Salem is, then possessed a larger fleet of vessels than all England possessed at the time of the

Spanish Armada. Whence comes our power of adapting ourselves to all the changing conditions of national policy and wresting our profit from every change? It is the common school, which is the solvent of race and creed; it is the school and its social influence more than what may be taught in it which is the source of intelligent energy by which under the stimulus of a harsh climate we force the apparent lack of any material resource to become the source of wealth. I have not brought this matter before you without reason. There is more profit awaiting you in saving the waste in your present mode of ginning, baling and preparing your cotton than there ever will be in its conversion into cotton fabrics but the place to begin is in the common school. Why do the French Canadians come in crowds to our factories to do the work which our own citizens are too prosperous to care to do now? Our own people — even the children of the foreign born who have been educated in our common schools — take up the hundreds of lesser arts of the workshop rather than the monotonous work of the operative in the factory; in these workshops of small capital the men are bred who make the State and who with trained hand and educated brain convert the cruder products of the forest, the field, and the mine into their higher forms for the use of mankind.

I have asked why we drain lower Canada of its French population. They came first to stay a few years and earn some money to carry back to their little farms, but their children bred in the schools of New England soon refused to return or came back from the monotonous life on the Canada farms and now make the integral part of our factory population.

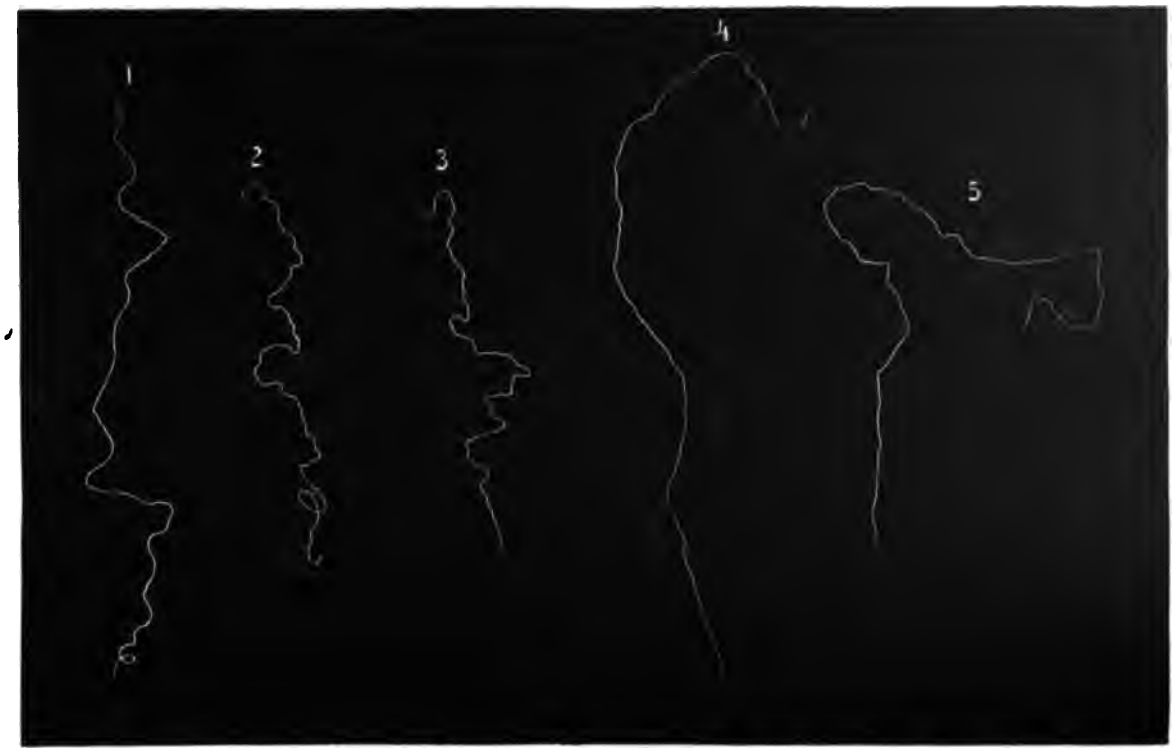
But don't you southern gentlemen flatter yourselves that we shall surrender our factory work to you; we have added a half million cotton spindles to our number in Massachusetts this year and when our supply of French Canadian operatives gives out we shall send down here and call your Georgia crackers and your mountain people from the Carolinas to come up and share our schools, our savings banks, and all the other social

appliances by which States are made rich and powerful. Take warning my southern friends and make your schools for black and white alike equal to ours in which we convert Jew and Gentile, — Irish, Germans, Poles, Bohemians, Slavs, Arabs, Negroes, and natives alike into American citizens, — we have some of every type in our Boston schools.

That is the first lesson in the improvement of your cotton and in making a profit from your wasted opportunity. I think you people of Georgia are Yankee enough to protect yourselves from our emissaries who may come to down to entice your operatives away by "going us one better" in your methods of education. If you do not it will take a bigger fine than North Carolina puts on the emigration agents who come there to hire away her black laborers to prevent us from securing the pick of your white mill operatives.

We will now take up the alphabet of the cotton fibre and begin our primary school! What do you say to that proposal from the northern theorist? The first question is, Why does cotton spin? I put that question to the members of this Association many years ago, when I submitted what I believe was the first microphotograph ever taken from the fibre itself — certainly the first ever taken in this country. When I put that question to the members of the Association, so many of whom have left us, I found that there was only one who could give the true answer,— the late Gov. E. A. STRAW, of the Amoskeag Company. Yet the whole theory of cotton ginning, baling and spinning rests upon the form and structure of the fibre; not until the form and structure of that fibre becomes a part of the common knowledge will you be able to correct the bad practices to which you now subject it.

Let the fibre speak for itself.



COTTON FIBRES. 1.—Texas. 2.—Rome, Georgia. 3.—Rome, Georgia, best. 4. Sea Island. 5.—Yazoo Delta, Miss.

It is the only one that nature prepares for us so that it can be spun without any previous treatment. One can imagine the first invention of a spun thread when some Aryan woman in prehistoric India picked the fibres from the boll and with her fingers spun a thread doubling with her teeth to make it stronger. Then came the distaff which is still in use among many nations of which all our spindles are but a development.

Whatever has been at any period in the world's history exists now in some distant place; the men of the stone age still make flint implements and dug-out canoes in Alaska and Patagonia; the Fellahs of Egypt still plow with a pointed stick; the cow is still the unit of value and money of account among the Zulu Kaffirs. Who demonetized the cow, bringing upon us all the embarrassment of the money question? The loom of the Pharaohs is still in use in your southern mountains and there are a greater number of people existing to-day who are clad in homespun than are yet supplied by our modern machinery. When their commerce is developed and we are enabled to exchange goods for their crude products free of obstruction, the problem put before us will be how to supply 1,400,000,000 people with fifty yards each of cotton cloth so as to bring them up to our present standard of consumption. At fifteen pounds of cotton — one-sixth out for waste — that would be twelve and one-half pounds of sheeting of four yards to the pound — a fair average fabric. That supply would call for 42,000,000 bales of cotton of 500 pounds each, or only about five times our present average crop. When you really learn how to make cotton, nothing less than a bale to the acre would be thought of — 640 bales to a square mile or 65,625 square miles for the full supply. Texas can supply the whole crop of 42,000,000 bales on less than one-third of her area. One average operative can now turn out 30,000 yards a year from a modern factory — it would therefore take only 2,300,000 operatives to supply 1,400,000,000 people of the world with cotton fabrics as adequately as we are now supplied ourselves. If the whole world were now as well

supplied with hand spun and woven fabrics, it would take 230,000,000 operatives to do this work. Yet we take three-quarters of the life out of our cotton by our murderous method of treating it. We nearly wear it out before we begin to weave it. Can we improve this work? The old saying used to be, "go to the ant, thou sluggard." I say, "go to the fibre, thou spinner."

Suppose you compare the cotton fibre with all its delicate convolutions to a twisted wire of steel of the same form and same shape but less liable to the effect of changes in the atmosphere. Imagine subjecting steel fibres to the tearing and rending process of the saw gin, what would occur? Wouldn't it be better to nip these fibres between two elastic rolls and to draw them away from the seed without upsetting, tangling and cutting them? Why not use the roller gin as they are compelled to in India because the cotton fibres are so closely attached to the seed? Why not use the roller gin as they choose to do in Egypt because the use of the saw gin on Egyptian cotton would impair its value one-quarter or one-third? Why do not the people of Texas raise Egyptian staple on the bottom lands of the Rio Grande and on some of their coast lands, keeping it separate from the green or woolly seed varieties — then preparing it on a roller gin? The only answer is, they do not yet comprehend the theory of the cotton fibre. Why have you failed to extend the cultivation of the Peeler and other long stapled green seed cotton? The answer is that you do not comprehend the theory of the cotton fibre and you mangle your long staple on a saw gin.

Let us return to our imaginary fibre of steel. Suppose you have ginned it in a barbarous way, what do you do next in the process of maltreatment? You have failed to see that the place where sand, leaf and other heavy waste can be most easily removed from the cotton is when it leaves the gin — you now pass it on to the press with nothing like the attention that is required. But now comes the beginning of a revolution — the man who first conceived a cylinder bale, made lap by lap with

the air excluded, has done more to modify and improve the treatment of the cotton throughout its course from the field to the fabric than any man that has existed since WHITNEY invented the saw gin. Your next step will be to take the cotton from the gins upon a belt of wire mesh under vibration or subject to a light beating with rods, thus removing all waste except the neps that are absolutely attached to the fibres. When the roller displaces the saw gin you will then wind the cleaned cotton upon the cylinder without upsetting or tangling the fibres or make a square bale in laps as it is done in the Rembert press. In this way you will abate the necessity for some of the most injurious practices to which the fibre is now subjected in the factory in order to remove the heavy waste. Now comes our own maltreatment in the factory. Imagine once more the effect upon a steel fibre of putting it through the openers and pickers of our factories. What would be the effect upon fine steel ribbons twisted spirally of subjecting them to bronze beaters at 1,400 revolutions a minute? How much injury would you save if the greater part of this work of cleaning had been done between the roller gin and the cylinder press?

Now when one found the fibres lying substantially parallel as they came from the seed through the roller gin, well cleaned in the cylinder or Rembert bale, might it not occur to some one to try to clean it fully without upsetting or tangling? If so the rotary beater may go and the parallel beater may be invented. But suppose we had carried our fibres in a true alignment up to and upon a finisher lap, then we come to the card on which we upset them and tangle them then teasing them over steel wire in order to straighten them out on the way to the other end of the machine. That process must be abated. How soon would the comber be used on 30^s and 20^s as it is now used on 40^s to 60^s if you could get rid of the tangling and teasing of the card wire. The comber is now used on low numbers for even hosiery yarn. Carry your steel fibre in imagination through a card and from that construct a theory of what happens to the more delicate cotton fibre. But

now we come to the drawing and doubling and here it will not take much imagination to conceive the injury. Suppose you have already "chawed up" the staple on a saw gin at a high speed, then baled it with all the dirt in it, then exposed it to the weather and rolled it in the mud, then cut it for sampling so as to catch more dirt, then compressed it in a high speed press so as to wrench every fibre in the bale by the differential strain, then beaten it in one opener and in one or two pickers, then upset it, tangled it and teased it on sharp pointed card wire in order to straighten it, what do you next do to take out what little life and elasticity there is left in drawing and doubling?

I don't know which side is ahead on the drawing, the manifold process or the other; but whatever may be the number of drawings and doublings, every pair of rollers through which the sliver is passed under more or less heavy weight does more or less injury to the fibre, sacrificing strength and elasticity in order to make an even yarn. Put your minds again on the steel fibre and imagine what would happen if you tried to draw convoluted or spirally twisted steel fibres apart which had become interlocked in your condensers. What happens to curled shavings if you try to draw them? Must not the same abrasion, the same breaking and the same impairment of elasticity which you can imagine in respect to a steel fibre happen to the more delicate cotton fibre when drawn apart over a sharp fluted steel roll and under a weighted leather roll? You may not do away wholly with drawing and doubling but the straighter and more even you bring your strand to the drawing the less bad work may you put upon it there.

Some of you may remember how near I came to improving Arkwright's leather covered top roll with its harmful rib where the edges are joined which causes the need of about one-half the weights you use in order to carry the strand by that little obstruction. Before the damp days came when our gelatine rolls failed we lightened the weight one-half on one side of a spinning frame and made eight per cent. stronger yarn than

from the same roving on the other side under the best leather covered rolls. My patent was the two hundred and forty-first worthless one; where is the man who will solve the problem of the seamless roll and add ten per cent. to the capacity of every cotton spindle then in existence?

All this may seem but a visionary forecast, but is it? In 1830 the average product of the best northern factory on standard sheeting in one year to each hand employed was 4,321 yards. This mechanism required the service of the most intelligent mechanics while the weaving and spinning were done by the well-bred farmers' daughters of New England who worked fourteen hours a day, earning $164 in 300 working days. In 1840, 9,607 yards, fourteen hours, earning $175. In 1850 the product was 12,164 yards per hand, hours of labor thirteen, earning each $190; thence year by year the wages were higher, the hours were shorter and the cost of labor in each year was lessened. That progress has continued — the French Canadians who now do most of the work turn out very nearly 30,000 yards a year of the same fabric in 300 days of less than ten hours each and each one earns over $300 a year on the average; in this progress the cost of labor has been greatly lessened and the product has lately been supplied to consumers at the lowest price ever known. The process of development will continue either on the lines of which I have given you a somewhat visionary forecast or on others, it matters not which.

If you give regard to the theory of the cotton manufacture which the form and structure of the fibre suggests you may therefore be led to think that there is some weight in my suggestion, first that the roller gin must displace the saw gin; second, the fibres must be kept on the lines in which nature laid them; third, the cleaning must be mainly done between the gin and the lap machine on which the bale of the future is to be made either in cylinder or square form; fourth, the beaters of the opener and picker must be abolished; fifth, the upsetting of the fibres must be avoided and the strand made by the

comber, saving the noils for a spongy weft for certain classes of goods; sixth, the pressure on all the drawing rolls must be lightened so that a stronger yarn may be brought to the new loom of which one weaver may tend twice the present number. That is my theory of the future practice in dealing with cotton in which each of you will reap a profit by saving the present waste in our empirical practice. If we may forecast the future from the past — and why should we not — some of the young men present will manage factories in which the product of standard sheeting will be 50,000 yards a year to each operative, the earnings of the operatives will be fifty per cent. more in money of which the purchasing power will also be fifty per cent. greater while the price of the goods may be less than ever before.

The rule of progress is that by way of higher wages we compass a constantly increasing product at a lessened cost. On the other hand, since wage earners or persons whose income is derived from small earnings constitute nine-tenths of the consumers of all the useful cotton and woolen fabrics, the more their wages rise the more they consume and thus the harmony of interest is established between labor and capital in the exact measure in which trained intelligence is brought to the direction of their joint force under the beneficent influence of intelligent competition.

When our friends in the South have learned the true secret of success in the promotion of the common school and in establishing equal rights and equal opportunity without distiction of race, color, or condition; when they prove that by their possession within their cotton kingdom of the imperial deposits of coal, iron and timber they can master us; when they have developed their advantages from within and through their industrial intelligences they hold out higher wages, greater abundance and better conditions of life than we can offer in far away New England, then we may begin to fear their competition and seek some better way to share with them in their abounding welfare than we now possess.

President GARFIELD once told me that he dated his intellectual life from a lecture which RALPH WALDO EMERSON gave in the high pulpit of the old parish church at Williamstown under the shadow of old Greylock mountain in the single year of college life which he enjoyed. He said that the lecture stirred him so that it seemed as if his brain were on fire and when he went out into the evening air it seemed as if old Greylock itself were on fire. He went to his room and tried to recall what EMERSON had said but all he could remember was one idea and that not in EMERSON'S words, "Mankind is as lazy as it dares to be." There is much meaning in that phrase. In our sterile State and harsh climate we never dare to be lazy but I have an impression that in your sunny South you sometimes risk it. Beware lest under the stimulus of our harsher climate we keep on the lead.

I date my own intellectual life from reading CARLISLE'S "Sartor Resartus" when I had first begun to get my living as a book-keeper in the office of a cotton manufacturing company. I learned from that book to strip the shams from every subject and to seek the truth of things; in other words, to find the theory by which nations live and the theory by which arts and industries are governed. It matters not what the subject may be, the true theory must be found and established as the rule. I applied this method of removing the shams or false conceptions by which the truth had been obscured as to cotton. I found the true theory of cheap cotton in free labor. Then I searched for the true theory of the art of spinning and I found it in the structure of the fibre itself. But before I reached the conclusion I found that as I held one end of the cotton thread in my hand the other end was held by the prehistoric woman who first began to twist that thread. As I untwisted the strand and unravelled the web I found in its folds the whole of human history, the growth of English supremacy in commerce, the perpetuation of slavery in this country by nearly a century. I found that the making of continents, and all the data of physical

geography must be regarded. I found it necessary to learn something of organic chemistry, to study how plants grow and to deal with nearly every science. In this address I have endeavored to give you a resume of this long research and to lead some of you to take up the thread where I must soon drop it, carrying it to the end and justifying my theory if it may perchance be true. The true theory is not yet fully applied.

There is still a considerable waste of the valuable elements of the cotton plant. Whenever the true process is discovered for removing the non-fibrous parts of the stalk of the cotton plant and from the hemp, flax and ramie stalks, the relative value of these fibres will be determined, while the portions of the plant which will be in the chemical solution may more than pay the cost of their separation because they will contain all the elements which are derived from the soil except what are in the seed already saved and what are in the root. The roots of the cotton plant also wait for the saving of the waste of tannin which forms a part and other as yet unknown values. In fact, when the cotton fibre is picked by machinery it may itself become the secondary product of this singular plant which, as I remarked in my address at your last exhibition, would long since have become one of our most valuable northern products if we could find a variety of the genus Gossypium producing an abundance of seed even if the seed had no fibre attached.

There is one other wasteful obstruction to true progress in the production of cotton and that is the cur dog of your rural districts. When science directed by intelligence is applied to cotton cultivation, the cotton crop will be raised in rotation with wool. The true laboratory of the cotton plant may be upon a somewhat sandy upland where sheep will thrive free of foot rot, cotton being a sun plant not requiring the excess of humidity of the bottom lands. A true soil laboratory would consist of a field of 400 acres on some warm southerly slope backed by a range of hills where the moisture of the gulf stream would be precipitated in frequent showers. I imagine that the neighbor-

hood of Rome, Ga., is such a place, although I have never been there. I judge it by the quality of its cotton.

For about $1,200 such a field could be surrounded with a five row barbed wire dog-proof fence and be also divided into four parcels of 100 acres each, with a moveable fence for a division of one section year by year into two parcels of fifty acres each. In the middle would be the stables, the silo, the tool house, the roller gin stand and the cylinder press — all built consistently with slow burning mill construction of heavy timbers and four-inch plank walls, protected throughout with automatic sprinklers.

The cotton would be planted in one field, in the next would have been planted winter grain and clover on which sheep would be fed in the first season to be carried through the winter partly on cotton seed. That field fertilized by the sheep would be the cotton field of the next year doubling the first year's crop per acre. The next field would be planted with corn and cow-peas to be cut into the silo, together making a complete food containing the nutrients in due proportion for the cattle pastured the first season on 50 acres of the fourth section, with some outside feed during the first year; while in the other 50 acres a crop of chufas would suffice for the hogs. After the first year the balance would be established and each year the product of cotton, wool, beef, and pork would be increased until at last some one might reach the potential of an acre of land and be able to measure its productive capacity. When you accomplish this vision you will not be seeking outside capital, but you may offer to lend some of your surplus wealth to your Yankee fellow citizens to help them supply you with the goods and wares from their factories and workshops on which the margin of profit may be too small for you to care to compete.

One might as well be hung for a theoretic sheep as for a prospective lamb. I may therefore venture to measure the potential of this upland cotton and wool farm in the first year

of true rotation, the second year of its being undertaken. This forecast only differs from a "Chateau en Espagne" in the certainty with which it will be attained. In this first year of true rotation — the second of the course — no call will be made for any import from without the five-row, barbed-wire, dog-proof fence except possibly a supply of phosphate and potash. If the basis of the soil shall happen to be on the limestone where blue grass thrives, even that extrinsic aid may not be needed.

Lot No. 1 of 100 acres, having been planted with turnips in the first year, cropped from the ground by sheep, may be expected to yield a moderate crop of 100 bales of cotton of 500 pounds each, say 50,000 pounds.

In lot No. 2 on 100 acres, which will have been planted in the first year with cow-peas turned under, a green or root crop will be raised which with cotton seed meal may carry ten sheep per acre yielding 5,000 pounds of wool, mutton and lamb added.

Lot No. 3 may be put into corn, say in the proportion of two-thirds and cow-peas one-third, in preparation for the silos. I have not the exact analysis by me but I think that this combination of corn stalk and pea vines would give substantially the right proportions of the protein or nitrogenous element of the pea vines coupled with the carbohydrates or starchy elements and the fat of the corn to make a complete food for the cattle and hogs of the next year.

Lot No. 4 will be divided into two parcels of 50 acres each. On one section two cows or steers to the acre could be fed on the less abundant crop of ensilage of the first year. In the next year the ratio would be four head of cattle to an acre. On the other 50 acres which had been previously prepared with cow-peas turned under, crops suitable for hogs could be made, notably chufas or peanuts. Would it be unreasonable to assign say six hogs to an acre, 300 in all, at 300 pounds each, say 90,000 pounds of pork?

Of course these are general divisions. Some paddocks or yards might be set off for the breeding stock to be kept separate

which are not counted. I think it best to be moderate in these estimates because I am dealing with the first year of regular rotation. What would be the production of the second, third and fourth year, no man is yet entitled to predict.

Neither have I thought it expedient to lay out the 100 acre lot outside the fence, on the part of which the owner would place his house and gardens next to a shady pine grove which would shelter both house and fruit garden from any prevailing cold or destructive winds from whatever quarter they might be expected. It would be interesting to deal with the right construction of that house on the slow burning or mill construction plan. It is eminently unfit for the northern type of country house to be copied in the South. In the North it is expedient to concentrate all the living rooms and to pay the utmost attention to provisions for warming the house through this long winter. Again, the common method of combustible architecture makes a house full of hollow spaces where fire may be warranted to pass most freely so that it cannot be reached by water; that type of construction being usually surmounted by what is called the "crazy roof" decorated with inverted mustard and pepper pots, full of leaky valleys and infested with a bad type of dormer windows is not suitable for the southern conditions. The true southern house ought to be a glorified log cabin like some of the buildings which the late great architect, H. H. RICHARDSON, developed from the principles of factory construction — solid, slow burning timbers, thick plank walls which if plastered will be finished solid upon the plank on the inside, surmounted by a flat deck roof not less than four inches thick to keep in the warmth in winter and to keep out the heat of summer, with a parapet around it so that the children may make a play space upon it in bad weather when it is wet and muddy upon the ground. A part of this roof may be so arranged as to be covered in with glass in winter for a winter garden. The Spanish style of lay-out might well be adopted, the structure surrounding three sides of a quadrangle, the interspace supplied with

a fountain and possibly glazed over in winter if one can afford it; the drawing-room and principal guest rooms being in one wing, the living rooms on the cross section and the offices and kitchen in the other wing. Of course no one would think of putting in the modern cooking stove or range of the infernal type under such conditions. There would be one big open fire in the kitchen for occasional use, a heater for boiling water, and an old-fashioned brick oven also for occasional use; but the main reliance for the scientific preparation of the food would be an Aladdin Oven made by the Tuskegee Colored Institute on the plan of the ovens which are now in constant use there and which are on exhibition here, with which the meats of the South which are apt to be tough can be prepared in the most tender and succulent manner while the ordinary abominations of the frying pan may be wholly done away with.

Neither do I find it expedient to treat the other half of the home place on which would be placed about twenty double tenements of four rooms each with an annex for the cooking constructed in the same general way for the forty hands more or less that would be required to carry on the farm, who with their families would pick the cotton. Of course about ten acres would be set apart for the chapel, the school-house and other necessary appliances of a cotton and wool farm when it is intelligently directed.

If any one will tell me how to picture a more attractive vision of improvement in the cotton fibre than this I will try to work it up. In the meantime would it not be worth while to begin this farm next year so that the products may be exhibited at the end of a four years' rotation at your next exhibition in the year 1900?

There is another matter to which the form and structure of the cotton fibre calls your attention. It is one of the most delicate hygrometers; it is very sensitive to slight changes in the humidity of the atmosphere. If the air is very dry the twist in the fibre contracts, if there is an excess of humidity it relaxes.

These changes, if frequent, as all spinners so well know, alter the number of yarn and make the weaving run badly unless met by the more or less effective set-offs which have been invented to counteract these changes. When the margin of profit is considerable the relative disadvantage of one place over another does not count for much, but with increasing competition the margin of profit on cotton fabrics has become very small and every small fraction of saving in cost or increase in quantity per spindle or loom becomes of great importance. So potent is this factor as to have caused a steady trend of the cotton spinning of England away from Mancnester, Stockport and other towns on the lowlands to Oldham and other places about thirty miles away, at points about eight hundred feet above the sea level upon the crest of the moors where the humidity brought in by the gulf stream is condensed, falling in constant showers although the amount of rainfall is but little more than half that of Massachusetts. Water is scarce and is carefully saved for steam power but the relative humidity of the atmosphere is very constant. Lest some of our southern friends should not fully comprehend this term let me explain that a constant of relative humidity means an even quantity of water held in the air throughout the day, varying very little between morning and noon and between noon and bell-time. The ideal atmosphere for fine cotton spinning and weaving is, I believe, a temperature of 70° F. maintained with the greatest attention to ventilation and a constant of humidity of about 75 per cent. In other words, the atmosphere in which the common house plants thrive best is one conducive not only to the healthy working of the cotton fibre but also to the health of the operatives who work it. So subtle is this atmospheric influence that it makes a difference whether coarse duck yarns which are spun in the interior of Maryland are woven where they are spun or by the margin of the sea in Baltimore. One of my most skilful clients who works under these conditions observed the larger product of his Baltimore looms and had not accounted for it

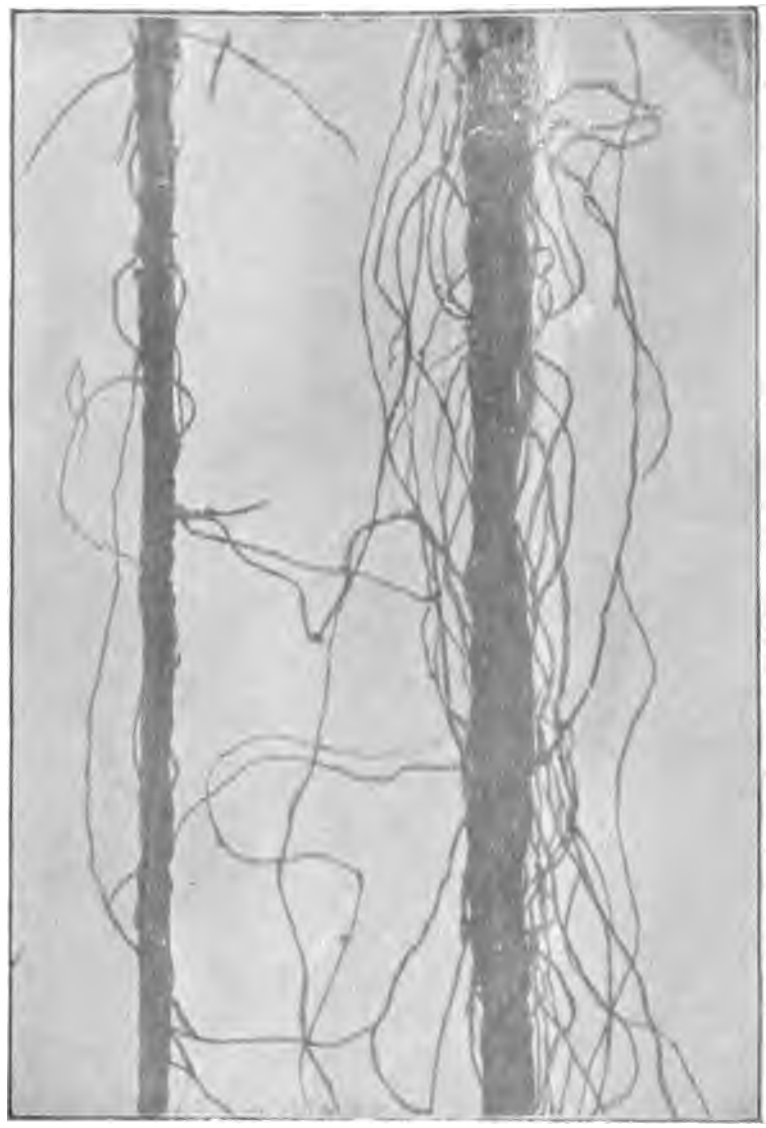
until I explained it to him. I have not been able to get the exact conditions of the present sites of most of the cotton spinning of Lancashire, but from some observations in the immediate neighborhood which I have compared with a record of seventy years in New Bedford, the latter place is equal in its favorable conditions to Lancashire and the same favorable conditions prevail from there along the coast by Fall River and Narragansett Bay as far as New London, Conn., at which latter point a series of observations discloses the same favorable conditions.

Of course you will refer to the various types of dampeners and humidifiers which are in use. I know their merits and also their demerits. I believe that I first suggested bringing Garland's atomizer before this Association. You can palliate and in some measure alleviate disadvantages in atmospheric conditions by such appliances, but where the natural conditions are the best the margin of profit will be largest and to that point the most skilful operatives will trend because that will be the place where they can earn the highest wages under the easiest conditions of the work by making the goods at the lowest cost per pound or per yard.

Even since the first draft of this treatise was sent to the printer, but before the proofs had been corrected, I have received from Mr. B. A. DOBSON of Bolton, England, an appendix to his previous work or "booklet" as he calls it upon "Humidity in Cotton Spinning."

His observations fully sustain the necessity of a constant of humidity in the spinning and weaving rooms, varying but little between morning, noon and night. After giving the data of a climate in which these variations were very great, Mr. DOBSON remarks, "Under such extreme and frequent changes (in relative humidity) a fine spinning industry cannot be successfully carried on. Any yarn produced under the circumstadces must vary considerably in quality and produce its effect in the patchy appearance of the finished cloth as the yarn is "'oozy' in spinning."

It is made manifest by every treatment of the subject that I



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HUMIDIFIED. ORDINARY.

have yet been able to secure—very few in number—that while a uniform degree of humidity is absolutely necessary to success either in fine or coarse numbers it by no means follows that the same per cent. of humidity will suffice. For certain goods a low degree may be better than the high degree which is conducive to success in fine numbers.

When I was in Lancashire some years since I went to a mill where the effort had been made to imitate the drills of which we export so many to China, made of about No. 13. The owner was not only a spinner but a most successful machinist whose machines are well known in the country and are used in some of our drill mills. Yet he had failed although using the same cotton, making the same numbers of yarn and weaving without extra sizing. He said that the only explanation that he could find was that the very humidity of the atmosphere which made that district so successful in fine numbers prevented him from making coarse yarn that would fill up in weaving so as to give the feel and finish which our standard drills and sheeting possessed made in a dryer and more electric atmosphere. The very first illustration in Mr. DOBSON'S treatise brought this conversation to my mind and I think it fully confirms the hypothesis by which my friend explained his failure on coarse numbers. I therefore take the liberty of copying that illustration.

This picture was developed while testing a mill near Manchester with and without a humidifier of the type known there as "The Unique."

Mr. DOBSON remarks that "An extraordinary and almost incredible difference appears; but it is to be noted that the yarn is intended to be exactly alike in numbers and twist. The difference in appearance of the finer yarn is caused solely by the facility with which cotton fabrics when free from electricity and of a proper temperature will twist solidly together. Of course the photograph has taken note of stray fibres which are not visible to the naked eye and the intensified difference is much exaggerated in the photograph for this reason."

"The enormous difference in appearance between those yarns spun under different conditions of humidity, as shown in the photograph, can be, to a certain extent, explained by the fact that yarns, when photographed, were fastened between two pieces of glass. The more open and less solid yarn has, therefore, been more flattened by the pressure of the glass than the better twisted and more condensed fibre in the more humidified yarn. This explanation applies to the whole of the photographs shown."

A more timely witness could not have been supplied to me in proof of our present empirical practice in the art of dealing with the cotton fibre, and I think the government of the Association might well print in the report of the meeting, either the whole of the late treatise by Mr. DOBSON, or very copious extracts from it with other illustrations, which I omit because the one which I have given fully sustains my own view of the very great importance of a full knowledge of climatic conditions in choosing the site of large cotton mills of which the profit or loss may rest upon this one question.

I think every member can imagine the different feel and finish of a standard drill or sheeting under the one condition or the other. May not the difference also explain the reason why the coarse hand spun and hand woven fabrics of China take indigo and other colors and hold them in a way which we have never equalled in our machine made fabrics; but that is another story. It would open the mooted question whether any of our dyes penetrate the cotton fabric as they do wool fabric or are only held upon the surface.

My southern friends are well aware that I have always counselled them to make haste slowly in developing the spinning and weaving of cotton fabrics. I admit that there is such a thing as thinking that one knows too much and thus losing a favorable opportunity; bnt there is also such a thing as getting the experience out of an undertaking while the other fellows get the money. I repeat the warning that there can be no permanent or continuous success in an art in which the margin of profit is so small as it is in this branch of industry until the great mass of the people have learned the difference between a cent and a nickel.

I do not now take back that warning but I may put it in the form of an interrogatory. Would it not be safer and perhaps more profitable to learn first the difference between a bad bale and a good bale of cotton fibre before making the effort on a very extensive scale to make a bad bale of cotton fibre into a good bale of cotton fabrics?

You all know the many disadvantages of small isolated factories and if to isolation is added unfavorable atmospheric conditions the struggle for success will be vain in competition with the great centres of the textile manufactures where all the subsidiary arts gather, where repair and supply shops abound and where there is a quick market for all the waste.

I have lately sent a memorial to Secretary MORTON, in whose department the weather bureau is, suggesting that in addition to the regular reports now made, a series of reports should be added on the relative humidity of the atmosphere morning, noon and night, at many stations, especially in the South. In twelve months the proper sites of fine cotton spinning might be well established in every section and the place where medium or course goods might pay the largest profit would also be indicated. This memorandum has been referred to the chief of the Weather Bureau and has been adopted. I think that our southern friends may be saved some misdirected investments if they will sustain this memorial and await the reports.

I have referred to the undiscovered values which may be developed from the fibre in the stalk of the cotton plant. Whether or not they can ever be saved or the fibre of the ramie be saved in this country is doubtful. The ramie plant is now being cultivated extensively in China chiefly in the province of Hankow. No method has yet been discovered for separating the outer casings of the fibre by chemical process without injury either to the strength or lustre of the fibre. I have never seen the natural plant and whether it grows like a reed or a flag I know not. It is gathered stalk by stalk at a certain stage of its growth determined by close culling during a period of about four months, the coatings of the fibre are removed by scraping

with knives made of bamboo which do not impair the fibre; this makes what is known as "ribbon ramie" in which form it is exported. The ribbon contains about thirty per cent. of gum and in that form it costs in France about six cents a pound. The problem of removing the gum has at length, I believe, been successfully solved, but until some kind of mechanism displaces the low priced hand labor of China we had better exchange our southern machine-made cotton fabrics for the ribbon ramie of the Chinaman than to try to raise it here.

Let me remark again upon a point to which I long since called the attention of the Association. The masses of China are clad in cotton fabrics; in a large part of north China where the climate is cold they are thick and wadded. If all the exports to China of cotton fabrics of Europe and America were used for clothing at five pounds a head they would not suffice for a fifth part of the population; but more than half these goods are said to be used for the boat sails and awnings of the great river population and for uniforms for soldiers. If China has been opened to trade by the Japanese, then there must soon be a much greater export demand either for the class of goods in which our southern friends have the best chance of competing with us, or for southern cotton to supply the Japanese and perhaps the Chinese cotton factories.

All these matters have a very important bearing upon the improvement of cotton if my theory is well grounded that there is in fact a much greater prospective margin of profit in the manufacture of cotton from the boll up to the bale inclusive, than there is from the bale to the yarn or woven cloth; this branch of the art also requires much less capital and is of necessity limited to the cotton States. You may cite to me the competing cotton growing countries of Egypt, India, China and the Argentine. The limit of land which can be spared from food crops in Egypt has been reached and cannot be extended until great works of irrigation now contemplated are completed which will occupy many years. Long before they are established, if ever they may be, I believe the Egyptian type of black seed cotton will be

grown in abundance in lower Texas; what chance will Egypt then have where the taxes even under English rule take half the product against the lightly taxed people of Texas? That State ought now to take measures for directing the industrious and intelligent although at present ignorant inhabitants of Italy from the Argentine to their State. In Italy great numbers of the people, perhaps all who can get the means to migrate are being driven away by the crushing weight of taxation, which is imposed mainly for the support of the passive war that is eating out the vitals of the continent of Europe in almost every country. Witness the testimony of Ouida the novelist recently given in London "Truth," which simply confirms the evidence derived from many sources.

"Official statistics state that in Italy there are 100,000 persons dying of pellagra, 6,000,000 living on malarious land, 1,700 communes in which corn is rare, 1,400 communes with scanty and foul water supplies, 600 communes which have no doctor within reach, and over 300 communes which have no burial-place. Every week steamships laden with emigrants sail out of her ports for Brazil and the Argentine. From Calabria alone 70 per cent. more emigrants have gone this year than last. Every month farms are abandoned and no one can be found to take them. Even in the rich country of the Lucchesia and Lunsigiana many lie untilled, while in the poorer regions southward from the Marches vast tracts of land are returning to their natural wild state owing to the provinces being depopulated by emigration. What does a country under these conditions want with African colonies? What it wants is to better the condition of its people on their native soil and to keep them at home. African colonies may be the desired outlet of a superabundant and over-crowded population, but there is not such a thing in Italy. There is not population enough for the needs of the country; and those who do remain at home are harried out of their lives and driven into crime by taxation, conscription, and the espionage of the police. The present government has confirmed for another ten years the tax of the *dazio consumo* (the food tax). It is the most cruel, inquisitorial, and harassing of all imposts; it is a hunger-tax, striking the poorest in their famished entrails; to abolish it would be more comfort to the Italian nation than all the victories of a Sulla or a Pomdeins."

With India it is unnecessary to deal. All of us who ever had any experience in spinning India cotton — my own covering over twelve thousand bales consumed during the war on mills of which I was treasurer, and a greater quantity in mills of which I was assistant treasurer — will say Amen to the prayer of the Lancashire operators, "Please, O Lord, to send us more cotton, but if it graciously please thee, O Lord, don't let it be Surats."

In regard to the Argentine, I learned among my earliest studies upon the cotton fibre that the only section of the earthy surface whence any future competition with the South on cotton and with the West on wheat might become serious consisted of the great prairies known as "The Pampas" upon the Paraguay and Panama ovens. At that time, twenty or thirty years since, they were closed by the bloody despotism of Lopez and Francia. They are now open and are being brought rapidly into cultivation by the Italians and the Hebrews who may presently overcome the the misgovernment of the Spanish-American caste. When the industry of the Italian is guided and developed by the intelligence of the Hebrew, both being in possession of equal rights, a new factor will become potent in agriculture. The negro has survived slavery and the Hebrew has survived centuries of persecution. All honor to the vitality and force which has been developed under such adverse conditions. The recent great shipments of wheat from the Argentine has excited surprise; they might have been anticipated by any one who has paid any attention to physical geography and climatology. The almost unknown continent is now South America, no longer Africa. In no other section of the earthy surface is there so vast an area of land of highest fertility and salubrity as yet but sparsely occupied as on these great pampas which extend from the outlet of the rivers near Buenos Ayres and Montevideo far up into the interior, including the high plains of Bolivia east of the Andes which though so near the tropics are yet so high above the sea level as to be cool and healthy, the rivers being navigable for many hundred miles by sea-going steamers. Under existing conditions, however, only cattle grazed on the plains and wheat raised

by machinery will seriously compete with our product; it will be a long time before population will become dense enough to pick cotton. On the other hand as these great resources of South America are developed a constantly increasing demand will arise for southern iron and machinery, for coal and for the class of cotton fabrics which the South can make to the best advantage. We hardly yet begin to conceive the portentious influence of the passing of the dominion of iron, steel, copper and coal — the truly precious minerals, from Europe to this country with all that it implies.

You will have remarked that one cannot deal with the improvement of cotton without constant reference to the element of nitrogen. About five years ago I was interviewed with many others by a newspaper reporter and was asked what would be the next great discovery of science, to which I replied, "a full supply of nitrogen at low cost." That discovery has been made and the potent instrument in developing the unlimited supply of atmospheric nitrogen is the cow-pea, the soya bean, the peanut, clover and all the other leguminous plants. Your pea-vine farmer in the South is the coming man.

When my friend Mr. J. STIRLING MORTON became Secretary of Agriculture I had a very early interview with him. I told him that the main fault in the conduct of the department had previously been that "it didn't know beans," and I then told him he must find a southern man to become assistant secretary who did know beans — naming my long-time friends and correspondents President MCBRIDE of Blackburg, Va., and Dr. DABNEY of Knoxville, Tenn., as the ideal men for the position. The Assistant Secretary of Agriculture, Dr. DABNEY, is the representative of the government in the exhibition and he can tell you for himself what he knows about beans.

After the Civil War ended our great Governor JOHN A. ANDREW advised all his close personal friends of whom I am proud to have been one, that their next duty was "the vigorous prosecution of peace." It was that wise advice that led me to study the resources of the South and to do what I could for

their development. I then made up my mind that the work of the department of agriculture should be devoted to beans and rice instead of silk and sorghum. Why? Because the nutrition of the soil, the plant, the beast and the man alike demand a due proportion of protein or nitrogen. We need it also in our own food for the development of muscular energy. The curse of the country is the American frying-pan with its horrid abominations of over-cooked and therefore indigestible fat and tough stringy meat.

A little over a year since Principal BOOKER WASHINGTON of the Tuskegee Institute, whose really great speech marked the opening of the exhibition in a singular manner, called upon me in Boston and put a case to me in this way: "If I am to elevate my people I must enable them to live better and to eat more wholesome food — our southern beef and mutton are tough and stringy and we are forced to live too much on bacon and corn."

I drew for him the design of an oven to be made of pine plank plastered on the inside, fitted over a sheet of iron with holes in it in which the heat from five lamps would as I assured him, convert the tough beefs, muttons and fowls of his neighborhood into tender, nutritious, juicy and appetizing food three to four hundred pounds a day, and in which he might also bake cow-peas so that they would rival Boston baked beans, assuring him also that with such ovens he could provide all the bread, bake the sweet potatoes, and cook other food for the supply of all the inmates of his school over six hundred in number. His ovens for that number to be of not over ten lamp power burning two or three gallons of oil a day. He has justified my assurance and the evidence can be seen, touched and tested in yonder building.

Now you will ask what have beans and rice to do with the improvement of cotton? A great deal; let me assure you and prove it. Cotton is a sun plant thriving in a very warm if not tropical climate. In the course of my studies I observed that in India and China the chief cotton producing countries outside our own, the principal food of the working people consisted of

rice and beans or peas; in Mexico of corn and beans; in Japan of rice or barley and beans; in Egypt of millet and lentils, and so on, each race having discovered by a process of natural selection that where meat is scarce or as in India forbidden to many races, the source of muscular energy nad been found in some variety of the leguminous plants which supply the nitrogenous element of food to which the physiologists impute the greatest source of muscular energy. Now it appears that in the order of nature and in the conservation of energy these legumes give homes to the bacteria by whom the nitrogen of the atmosphere is dissociated and is thus converted to the nutrition of soil, plant and beast, and finally of mankind.

There are in India and Japan many varieties of upland rice which require no irrigation; there are many varieties of legumes of which we know little. I imported from China for your exhibition of 1881 two or three bushels of soya beans which were there distributed; that variety has become one of your most valuable forage plants.

The improvement of cotton will be commensurate with the development of intelligence and energy — these factors are found in least measure in hog and hominy — least of all in the abominations of the American frying-pan. For these reasons I counselled your representative in the present cabinet to learn the science of beans and to supplement it with upland rice.

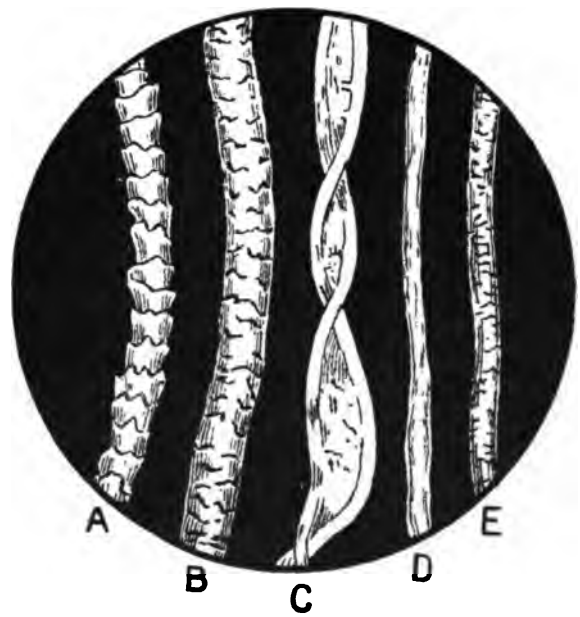
I have also remarked that emigration pursues its way on parallels of latitude; the Italians have been diverted for a time from the north latitude to which they are accustomed, to the pampas of the Argentine in the same plane south of the equator. The emigrants which you may most surely attract to your vacant lands will come from the south of Europe where the diet of the workman consists but little of meat but is almost wholly of bread, cheese, beans and lentils.

If you cannot trace the connection of these remarks to the improvement of cotton I have failed in my effort and will now give you a rest.

ADDENDA.

The common but very erroneous conception regarding the cotton fibre still holds in many places. It was long believed that the adherence of one fibre to the other by which we are enabled to spin cotton without any artificial preparation except separation from the seed, was due to barbs or hooks of a minute kind upon the edges of the fibre. This conception is without any basis in fact. The cotton fibre is formed in the boll in a cylindrical shape folded in various ways. This fibre is filled with a watery sap. When the cotton reaches maturity this watery sap dries off filling the interior with very minute spines which by their formation give to the outer form of the fibre the convolutions of a twisted ribbon a little thicker at the edges than in the middle, pointed at the end and always twisted in the same direction on its own longitudinal axis. It is by this twist or convolution that the fibres become interlocked and thus adhere one to the other. Immature cotton is apt to be straight and smooth; it will not spin well. In some seasons the proportion of immature to mature cotton makes a large part of the crop a bad one for spinning. One advantage of the Egyptian cotton on fine work is the certainty of a long and suitable season for ripening the fibre, giving every one its due twist, and the assurance of a picking season free from any considerable changes in atmospheric conditions. In order to make these facts plain the following diagrams are given which have been taken from the great work of Dr. F. H. BOWMAN, copies of which may be had from John Wiley & Sons, New York.

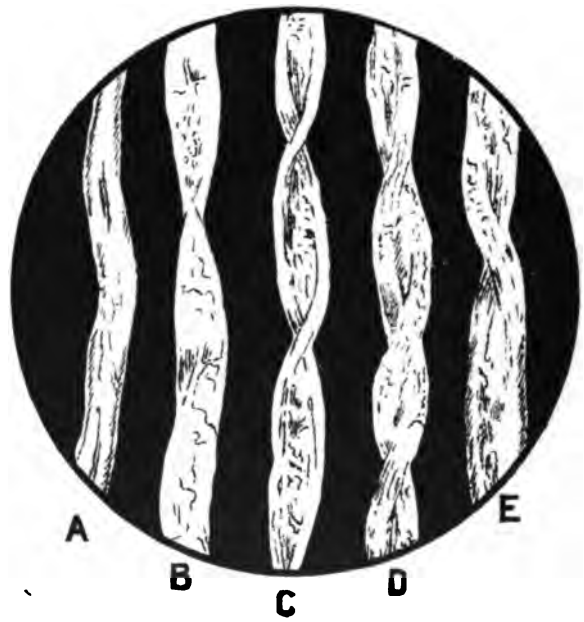
Plate III



325 DIAMETERS.

A. Fibre of Chinese wool.
B. Fibre of Leicestershire wool.
C. Fibre of cotton.
D. Fibre of silk.
E. Fibre of mohair.

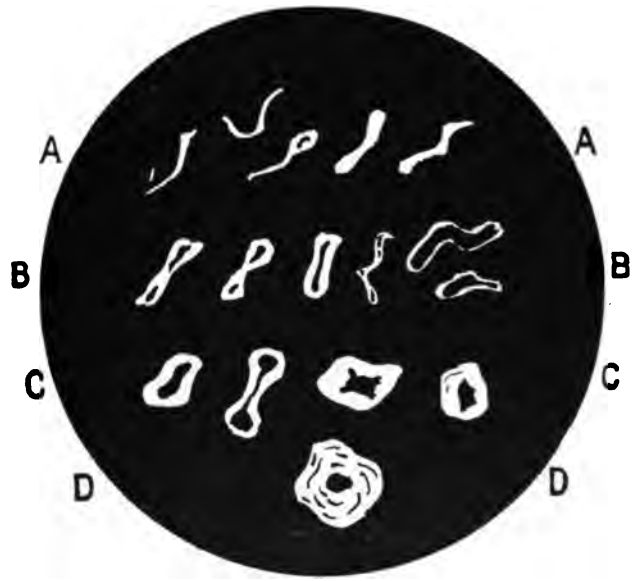
Plate IV



325 DIAMETERS.

A. Glassy, structureless fibre.
B. Thin, pelucid, unripe fibre.
C. Half ripe fibre with thin cell wall.
D and E. Fully mature and ripe fibre with full twist and thick, well defined cell wall.

Plate V

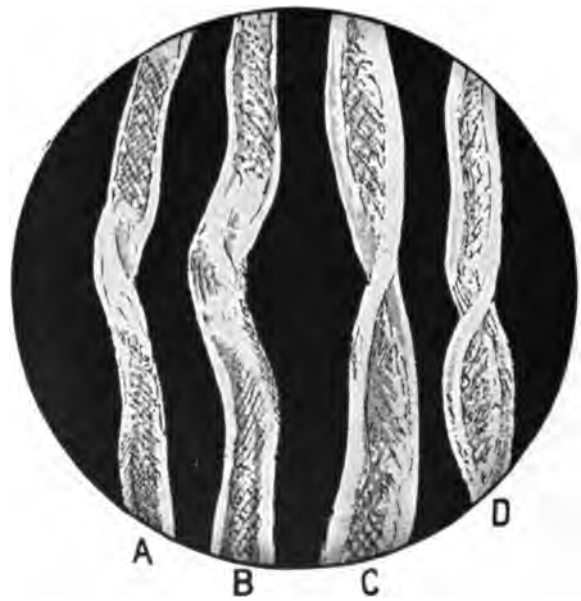


450 DIAMETERS.

SECTIONS OF COTTON FIBRE.

A. Unripe, unmatured fibres.
B. Half ripe fibres.
C. Fully matured and ripe cotton.
D. Section of fibre showing laminated cell walls.

Plate VI



300 DIAMETERS

COTTON FIBRES SHOWING SPIRAL STRUCTURE.

A and B. Fibres of wild African cotton.
C and D. Fibres of coarse Peruvian cotton.

The PRESIDENT. I will ask Mr. ARTHUR H. LOWE to read the next paper, on Cloth and Yarn Calculation Simplified, by Mr. ARNOLD SCHAER, of Warren, R. I., who had expected to be present but was obliged to remain on account of the burning of the mill under his charge. There are two of these special slide rules invented by Mr. SCHAER, for making cloth calculations, which are here for the inspection of members.

CLOTH CALCULATIONS SIMPLIFIED.

MR. ARNOLD SCHAER, WARREN, RHODE ISLAND.

Mr. President, in presenting this paper to your Association, I wish to state that I am doing so at the request of some of our members, believing as they express themselves, that a paper from a member describing an invention applicable to his own work, and therefore to that of others, will result in mutual benefit.

It is not my intention to discuss the method how to get at the cost of manufacturing cloth. This subject has been very carefully and minutely discussed a few meetings ago, and every detail entering into the cost item was considered. In this connection I would simply say that one of the first and most important factors in ascertaining the cost of any cloth, is to have a right start by calculating accurately the number or average number of yarn required, as everyone knows costs go nearly in proportion with the average number of yarn, and this paper is intended particularly to show the methods how to find the correct number of yarn with the smallest effort; hence the title which I have chosen.

Members will please bear in mind, in following me through this discussion, that I do not have the idea that my way of calculating is the only correct way; there are a great many different methods in use and they all lead practically to the same result, only some require more figures and are slow, others require less and are faster, whereas by my latest method no figures are required except in writing down the results, which saves a great deal of valuable time and is less liable to error than is often caused by the manipulation of figures two or three times over.

In order to make the subsequent description and explanation of my *Cloth Calculating Rule* better and more easily understood, I will describe first the method of cloth calculation by figures in what I consider the simplest way.

We all know that the factors entering into cloth calculations are the *count*, or threads per inch, the *width*, and the *weight* usually given as so many *yards per pound*, and the problem is to calculate from these given factors *the number of yarn* that will produce such cloth, or *vice versa*, if the number of yarn is given, to find out the weight of such cloth.

The ordinary and simplest rule to calculate the average number of yarn in a given piece of cloth, of which are known count width and yards per pound, is this formula, for 6 per cent. contraction:

$$\text{Average number of yarn} = \frac{\text{width} \times \text{average count} \times \text{yards per pound.}}{395}$$

The divisor 395, without contraction, would be 420; with 10 per cent. contraction 378, and so in proportion to the per cent. contraction that in our judgment exists in the kind of cloth we have to figure, the per cent. of the contraction would be deducted from 420.

Virtually the same rule is used a great deal, only instead of using the average count, the count of warp and filling are added, and then the divisor without contraction is 840, the standard for yards in one hank of cotton yarn.

In case the average number of yarn is known but not the

weight or yards per pound, the foregoing formula would simply reverse as follows:

$$\text{Yards per pound} = \frac{\text{Average number} \times 395}{\text{Width} \times \text{Average Count.}} \text{ (if 6 per cent contraction.)}$$

or,

$$\text{Yards per pound} = \frac{\text{Average number} \times 790}{\text{Width} \times \text{(count of warp,} + \text{count of filling.)}}$$

We will see now how these problems in either form, the answer required being the average number of yarn or yards per pound, are solved with my *Cloth Calculator*. (See figure 1.)

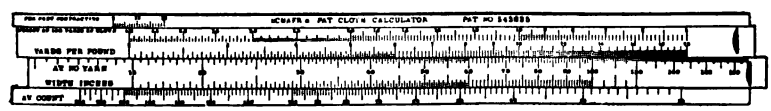


FIGURE 1.

By looking at the drawing of same it will be seen that there are four graduations representing the four factors, which combined make up a piece of cloth, count, width and weight and average number of yarn. Three of those factors are always known and the fourth one bears a certain proportion to the others. These graduations are so proportioned that just as soon as any two of the known factors, say width and count (width is found on the slide, count on bottom of rule), are put opposite one another, the two upper graduations (average number on slide and yards per pound or weight per 100 yards on adjusting piece) will at once establish a complete table showing the average number of yarn required opposite any yards per pound. Therefore all that is to be done to find the answer is to look opposite the yards per pound, or weight per 100 yards for the average number of yarn, or if the average number of yarn is known look opposite that number for the yards per pound.

It is not to be forgotten that the amount of contraction, for which there is a special graduation on top of rule, has to be adjusted first, according to the judgment or experience of the operator.

To illustrate: take a cloth 36 inches wide, 60 x 80, three leaf, four yards per pound, required, the average number of yarn.

The contraction on such a weave will be 6 per cent; therefore set mark 50 on the adjusting piece opposite 6 on contraction graduation, and the rule is now ready to solve any problem based on this per cent. of contraction.

To find the average number of yarn, set the width (36 on slide) opposite average count (70 on rule) and you will, by looking at the two other graduations, find opposite 4 yards per pound, average number 25 1-2 on slide, which is the answer.

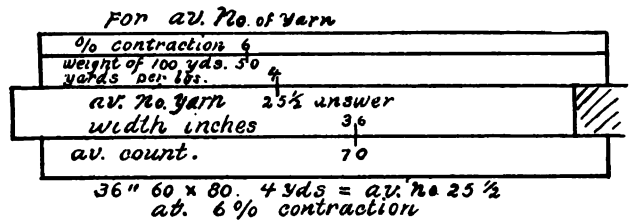


FIGURE 2.

The two graduations, yards per pound and average number of yarn, together represent in fact a complete table, showing average numbers of yarn, for any yards per pound, so 5 yards per pound requires 31 yarn; 6 yards per pound requires 38 1-4 yarn; 7 yards per pound requires 44 1-2 yarn; 8 yards per pound requires 51 yarn, etc., etc., the numbers of yarn being in proportion to the yards per pound.

Or if the average number of yarn was known, but not the weight, and you wanted to find what cloth of this width and count would weigh, read simply the other way, 25 1-2 yarns makes goods 4 yards per pound; 30 yarn 4.7 yards; 40 yarn 6.28 yards; 50 yarn 7.85 yards, etc., etc.

It will be seen, therefore, that just as soon as two known factors are set opposite one another between slide and rule, the other side will show opposite the one we know the one we want, whether it be the yarn or the weight.

A cloth of average number 25 1-2 may be made of 24 warp and 27 filling, or 28 warp and 24 filling, or 40 warp and 20 filling; oftentimes it is left with the manufacturer to choose his yarns, but sometimes certain numbers of warp or filling are specified in contracts, and in such cases it is best to figure warp and filling separately, because where there is a great difference between numbers of warp and filling — say 40 warp and 20 filling — the apparent average number 30, would lead us astray in our calculation, as in the case cited, 60 threads of 40s to 80 threads of 20s, will be actually an average number of 25 1-2.

It would take too much of your time to explain here the method of finding from two different numbers the actual average. No doubt most of the members are familiar with the problem and I will therefore not enter into these details, but will show how warp and filling can be figured separately on the rule.

We will take for an example the same kind of cloth, 36 inches wide, 60 x 80, three leaf, 4 yards per pound, warp stipulated to be 40s, and the problem is to find what number of filling will produce cloth 4 yards per pound.

If this calculation is made by arithmetic or figures, we should have to reason as follows: goods 4 yards per pound will be equal to 25 pounds for 100 yards; then after finding what the warp, 36 inches, 60 threads per inch, weighs, we should deduct this from the total weight and thus obtain the weight of filling required. This weight would then form the basis for the final calculation, what number of filling, 36 inches, 80 threads per inch, would make this weight.

The identical reasoning applies when doing these calculations on the cloth calculator, only we simply note the answers, deduct

the weight of warp from the weight of cloth by subtraction, and having thus found the weight of the filling, read opposite that weight the number of filling.

These goods will contract about 6 per cent. so keep the rule set as before at 6 per cent. contraction; find over 4 yards per pound, 25 on graduation showing weight of cloth for 100 yards, 25 pounds. For the basis of this calculation I must use 200 yards, as the rule shows weight for 100 yards of cloth all warp, and 100 yards all filling.

Now find the weight of number 40 warp for 100 yards of cloth, which is 36 inches, average count 60, in same manner as previously shown.

Set width (36 on slide) opposite average count (60 on rule), and read opposite forties yarn (on top of slide) 7.33 which would be the yards per pound, but we want now the actual weight, therefore read straight over that *13.8* on scale, representing weight of cloth for 100 yards, which shows the weight 13.8 pounds.

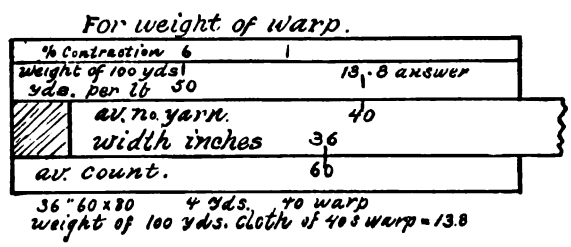


FIGURE 3.

200 yards of cloth weigh 50 pounds, 100 yards of cloth 60 x 60 of forties yarn 13.8 pounds, therefore the difference 36.2 pounds represents the quantity of filling.

To find from this the number of filling we do just as before: set width (36 on slide) opposite average count, 80, and read below 36.2 pounds and the number of filling which shows twenties.

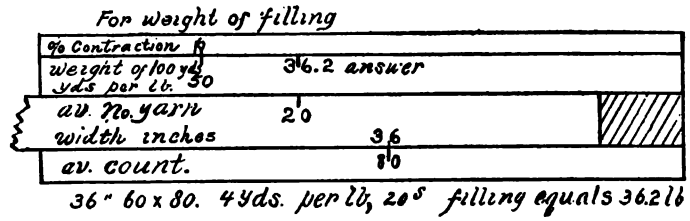


FIGURE 4.

The contraction of cotton cloths in weaving for light sateen weaves will run about 5 per cent., for heavier ones and twills 6 per cent., for medium plain 7 to 8 per cent., for heavy plains 8 to 10 per cent. For some kinds of fancy cloths, such as welts, it may go as high as 15 per cent. The graduation for per cent. contraction is carried to 20 per cent., so that on some weaves that are to be heavily sized, the per cent. of weighting by starch can simply be reckoned as so much more per cent. contraction.

The graduations, as already stated, when showing the table of yards per pound, and numbers of yarn, being an exact proportion right through, are also adaptable for any other calculation in mill or office work, such as changes of gears, speeds from size of pulleys, size of pulleys to produce certain speeds, production per spindle and certain speeds or yards per loom, proportionate cost per pound of yarn, etc., etc. Upon this subject I am preparing a special pamphlet, which will be sent to every user of the cloth calculator.

There is another kind of cloth calculation necessary, especially in what we might call change mills or mills that work on orders, and that is to figure cloth from a small sample submitted, and the only factor given by the buyer is perhaps the width required. The mill in such cases has to ascertain from such samples the count and weight. The count is easily found with the pick glass; the weight of the cloth, however, is more troublesome. By the ordinary methods in use this is done by weighing the small piece in grains, finding the exact area of the sample in square inches; by dividing the area of one yard in

length of such cloth by the area of the small sample, it is found how many snch samples make one yard in length, and multiplying this by the grains, the weight of one yard in length is obtained, and as there are 7,000 grains in a pound, 7,000 divided by the grains of one yard will give the yards per ponnd.

To dispense with this complex calculation, I have devised a *template and scale*, whereby a sample can be cut *in proportion to the width of the cloth*, and this has to be weighed on a specially designed scale, shown in Figure 5, showing the reciprocal value of the actual weight in grains, instead of *grains*, and the reading will give at a glance the yards per pound.

FIGURE 5.

The graduations of this scale shown in Figure 6, are so calculated that with weight marked one, 50 grains will balance at 20, 40 grains at 25, 25 grains at 40, 20 grains at 50, 10 grains at 100, etc., etc.; in fact, it shows throughout instead of the actual grains, the reciprocal value of 1,000 to the grains, which you all know is the number of yarn, when one lea is weighed in grains.

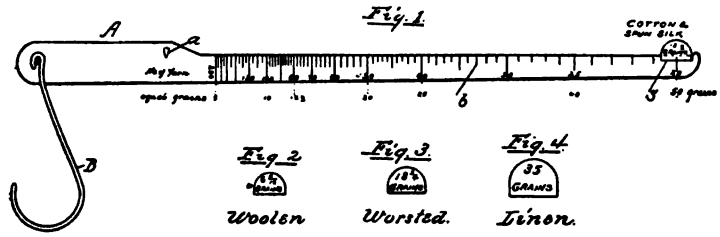


FIGURE 6.

This is the basis of the yarn scale, and as the yards per pound are reciprocal values of the actual weights, 2 yards per pound being 50 pounds per 100 yards, 4 yards 25 pounds, 5 yards 20 pounds, 10 yards 10 pounds, the same scale will show yards per pound, by dividing the number (which is yarn number) by 10, or taking of one decimal. I may decide to make a special beam for cloth, marking the divisions 2 to 24, instead of 20 to 240, so as not to necessitate the division of the reading by 10 for the yards per pound.

In cloth or yarn calculations we only use the grains as a basis for further calculations; we don't care about the grains; what we want to know is the number of yarn, or roving, or the yards per pound; we never get an order for cloth or yarn, so many grains per yard, therefore, why not have a scale that shows just what *we want to know — the number of yarn* or the *yards per pound*, requiring no further manipulation. Should we for any purpose want to know the actual grains of a sample, this can be weighed on the same scale, and by dividing 1,000 by the reading, the grains are obtained, just exactly in the same manner as with a common grain scale we calculate the yarn number from grains.

The graduations being calculated as above become very progressive; they are figured and cut very accurately and are fully as reliable as the regular graduations on an ordinary scale beam, hence give the *final answer*, just as correctly as an ordinary scale will show grains.

After we have ascertained from a sample how many yards there are in a pound, the number of yarn required can be calculated by arithmetic, or by my calculating rule, as explained before; but I have still another way. This can be done by cutting the sample in proportion to its average count and weighing it on the same scale, and the reading will show at a glance *the average number of yarn*, at 5 per cent. contraction. The template for this purpose is just the same size as the one previously referred to, but is graduated in proportion to average count from 30 to 160, and the width of it, combined with the length determined by the average count, will give a sample that will contain 120 yards of yarn. A sample cut to 160 is just half the size of one cut to 80, and a sample cut to 40 is double of one cut to 80, and so in proportion. If the goods are of heavier contraction, then add as many per cent. to the reading as there is more than 5 per cent. contraction.

These two templates have been for convenience combined into one. The count graduation to obtain average number of yarn is on top, the width graduation for finding the weight or yards per pound is on the bottom.

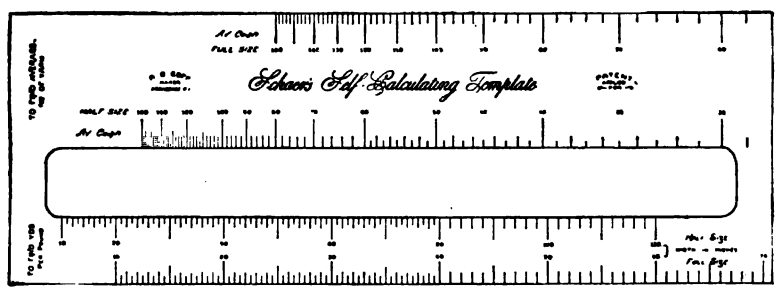


FIGURE 7.

The graduation for widths of cloth is so calculated that a sample cut to the width mark and to the full width of the template will be just one-seventieth the area of one yard of cloth; therefore, 70 such samples would make up one yard, and bear-

ing this in mind, if any one doubted the correctness of the scale shown in Figure 6, it will be an easy matter to compute by the weight in grains what one yard would weigh or how many yards there will be in a pound.

Very often samples sent to mills are very small. To enable such being cut to size, provisions are made whereby they can cut to one-half or one-fourth width of the template. There are also two graduations, one full size and one half size, so that samples can be used one-half, one-fourth or one-eighth size. Correspondingly smaller weights go with the scale, so that no calculation is required, even for such small samples.

There is one point in connection with the weighing of a small sample, whether it be yarn or cloth, that by doing so on my self-calculating scale or on a grain scale, we find the weight of this sample only. We all know what variations there are in yarns, when sizing it by leas of 120 yards; when reeling forties we may find some leas going as low as 37 or as high as 43, although the average of 4 leas or more may be correct. These variations may occur just the same in a small sample of cloth, and will register in yards per pound; therefore it is very desirable, in order to get a fair average, to use as large samples as possible; but if a buyer sends us a small sample only, without giving any particulars except the width, the template and scale will tell us just what the weight of such cloth is based on that sample, and all we can do in such a case is to make the cloth like that sample.

These mathematical instruments, scale, template and calculator, once correctly made, are there permanent and make no more errors, which the best of us sometimes do when in a hurry manipulating figures two or three times over. The reading of template and rule will require a little practice and perhaps a little patience to begin with, but I do not see why it is not just as easy to read these graduations by tenths, as it is to read a two-foot rule by quarters, eighths and sixteenths. The graduations are so carefully calculated and marked that the

results are just as accurate as if you had measured the problem before you with a rule divided into hundredths of an inch; in fact, all the problems which may occur in this line have been minutely figured beforehand and graphically put down in the form of graduations for future use.

Session adjourns to meet at Council Chamber in Chamber of Commerce Building, corner of Pryor and Hunter streets, October 25th, at 10 A. M.

MORNING SESSION,

10 A. M., OCTOBER 25, 1895.

Council Chamber, Chamber of Commerce Building. Meeting called to order. President GOODALE in the chair.

The PRESIDENT. The first paper on the programme this morning will be No. 4, "An Improved Method of Preparing Cotton for the Market," by Mr. WILLIAM E. ANDERSON, of Little Rock, Ark.

Mr. WILLIAM E. ANDERSON. Before commencing to read my paper I would like to call your attention to these bales in the room; and I will open one of them that you may see and understand what my remarks treat upon. (Bales shown and opened.)

AN IMPROVED METHOD FOR PREPARING COTTON FOR MARKET.

Mr. W. E. Anderson, Little Rock, Ark.

IDEAL METHOD.

A perfect method for preparing cotton for market would consist in first, picking it carefully; second, thoroughly drying the seed cotton; third, removing all imperfect bolls, hulls, leaves, and trash, and part of the sand and dust; fourth, ginning so as not to break or strain the fibres; fifth, separating all sand and dust from the lint; sixth, forming the lint into a thick, homogeneous bat in which the fibres are arranged approximately parallel with the length of the bat; seventh, expressing air from the bat and winding it without distortion into a bale where it is held in uniform state of compression, as severe as may be without injury to the fibre, and from which it can be entirely unwound in the same condition that it was when wound up. This bale should be such that *all* the cotton put in it would reach the manufacturer. It should be thoroughly fire-proof, covered and bound in a strong, cheap, and light material, accurately and indelibly marked, and of such size and shape as to be most easily handled and stored.

No one is yet prepared to operate such a method in full, but our company is now engaged upon the development of machines which will enable us to practice it completely, and we have every reason to expect that these will be quickly brought to perfection.

METHOD OF STANDARD CIRCULAR COTTON CO.

We have at the present time developed and are operating in our plant at Little Rock, means of accomplishing the following named results: first, separating from the seed cotton all hulls, imperfect bolls, and other solid matter, except badly mutilated leaves and part of the dust and sand; second, ginning with considerable less damage to the fibre than it usually sustains in this operation; third, removing all dust and sand from the lint; fourth, forming the lint into a thick, homogeneous bat; fifth, expelling air from this bat and winding it smoothly into a bale like those exhibited here and shown in photographs E and F, the peculiar advantages of which will be shown later.

I am not now at liberty to describe the apparatus for cleaning the seed cotton.

The improvement in ginning consists simply in employing a machine that always carries a loose roll so that each seed is allowed free motion, which prevents the injuring of a great many fibres. We have by no means accomplished all that is desired in this direction, but we are doing better all the time.

The sand and heavy dirt is removed from the lint by inertia and gravitation methods, and the light dust is blown through a condenser screen which travels so rapidly that the bat of cotton upon it is never thick enough to catch much dust. We could push this cleaning to any desired degree, but we realize that cleaning cotton too well at this time would result in a great loss of money to us. Manufacturers are used to buying 90 per cent. cotton and 10 per cent. dirt, and could not at once be made to understand that they can receive their raw material in a cleaner condition.

The bat-forming apparatus consists simply of two endless belts traveling downward at a low rate of speed, and arranged to form a V-shaped hopper into which the thin bat from the condenser is delivered. This is shown at D in Fig. 1. By this means a practically uniform bat of any desired weight can be made.

The press is the most radical departure from existing methods and I shall therefore describe it fully.

Fig. I. is a sectional view of the press and condenser in position for beginning a bale.

Fig. II. is a sectional view of press as it appears when making a bale.

Fig. III. is a sectional view illustrating the mechanism for removing and inserting the core shaft upon which the bale is wound.

Photograph A shows press in position for beginning bale.

Photograph B shows press in process of baling, bale one-quarter completed.

Photograph C shows press when bale is nearly completed and core shaft is being withdrawn.

Photograph D shows press when bale is being expelled.

The essential features of the press are: compression rolls, E E, which expel air from and condense the bat; baling belt, H, which holds the bat as it is being wound up, imparts motion to other parts, etc.; baling rolls, J J, which help the belt to hold the bat; core shaft, H, around which the bat is wound and which holds the end flanges against the thrust of bale; end flanges, I I, which guide the bat as it is being wound up and admit the production of bales with firm, flat ends; tension mechanism, Q, which causes the belt to press hard against the forming bale and also to hold the baling rolls in; core operating mechanism, R, which at the proper time in the formation of bale, withdraws the core shaft and again replaces it as the completed bale rolls away; swinging arm, M, which permits the removal of completed bale.

The compression rolls are plain, cast iron cylinders, 12 inches in diameter, one of which is mounted in fixed bearings while the bearings of the other are movable and are borne in by rubber cushions.

The baling belt is built up of steel links strung on five-eighths-inch steel rods.

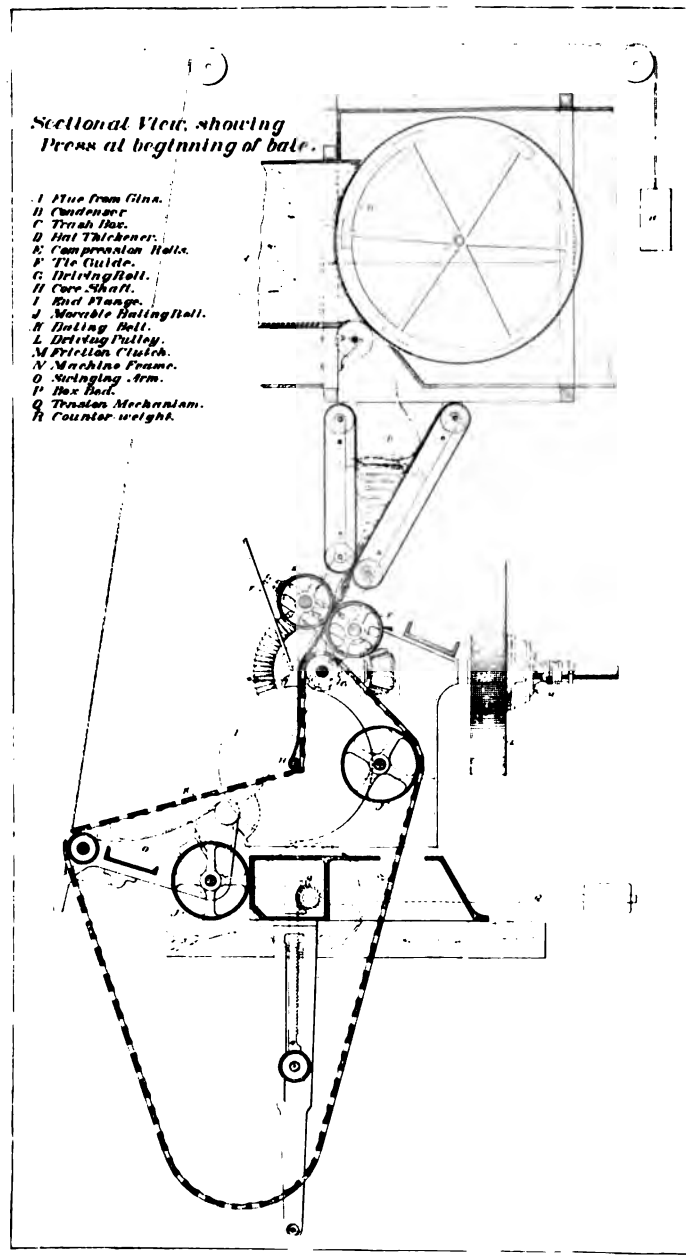

Sectional View, showing
Press at beginning of bale.
A Flue from Gins.
B Condenser
C Trash Box.
D Hat Thickener.
E Compression Rolls.
F Tie Guide.
G Driving Roll.
H Core Shaft.
I End Flange.
J Movable Balling Roll.
K Balling Belt.
L Driving Pulley.
M Friction Clutch.
N Machine Frame.
O Swinging Arm.
P Box Bed.
Q Tension Mechanism.
R Counter weight.

FIGURE 1.

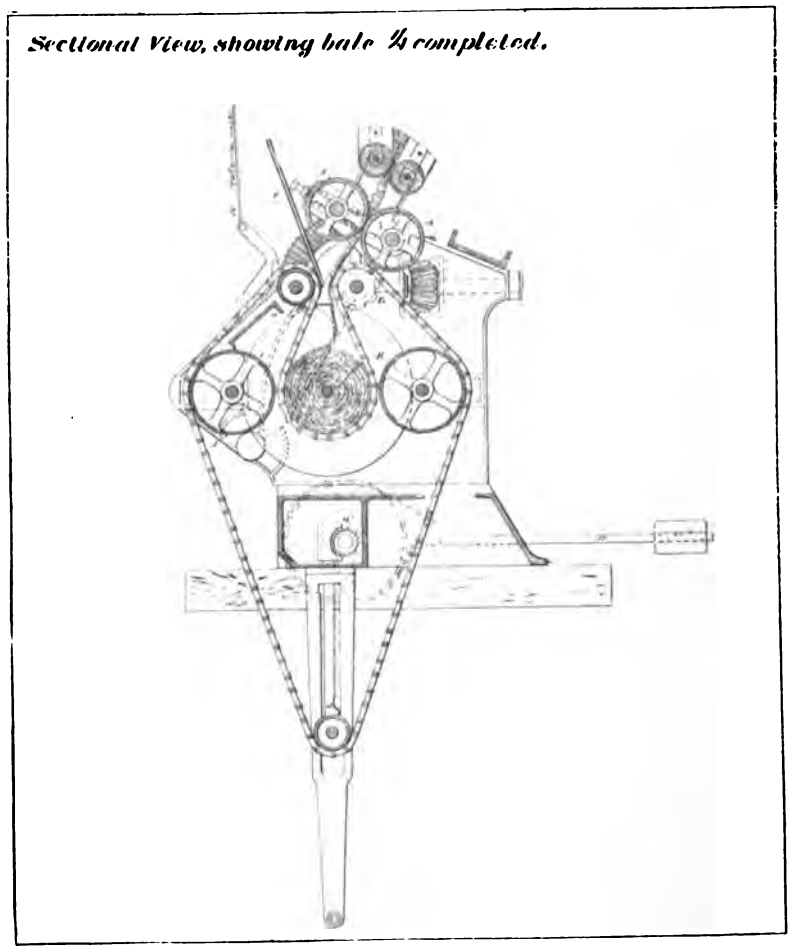


FIGURE 2.

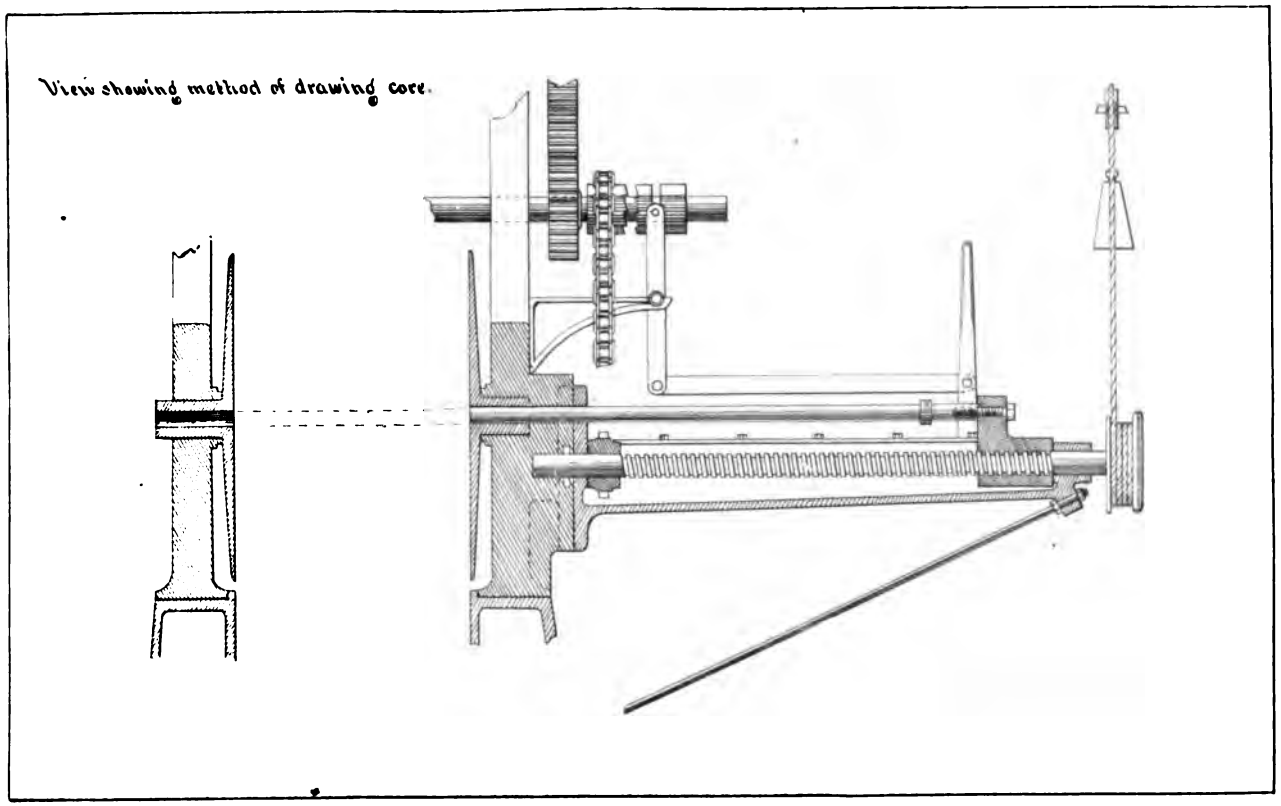
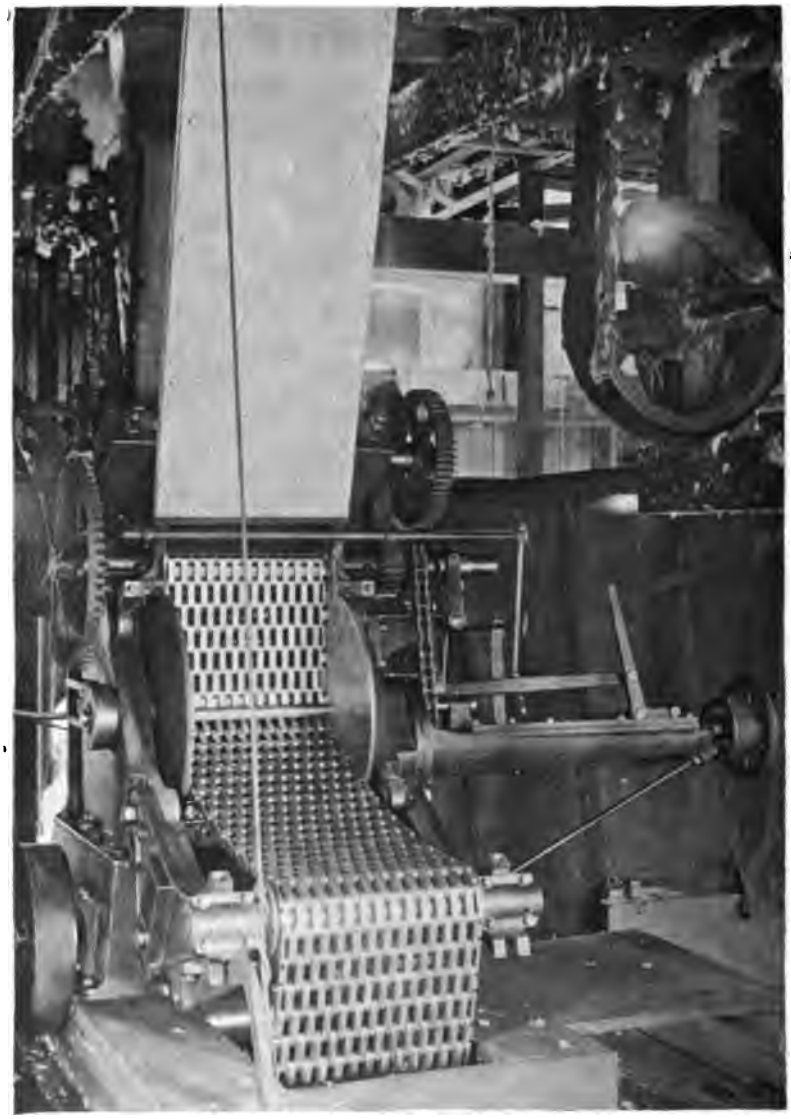
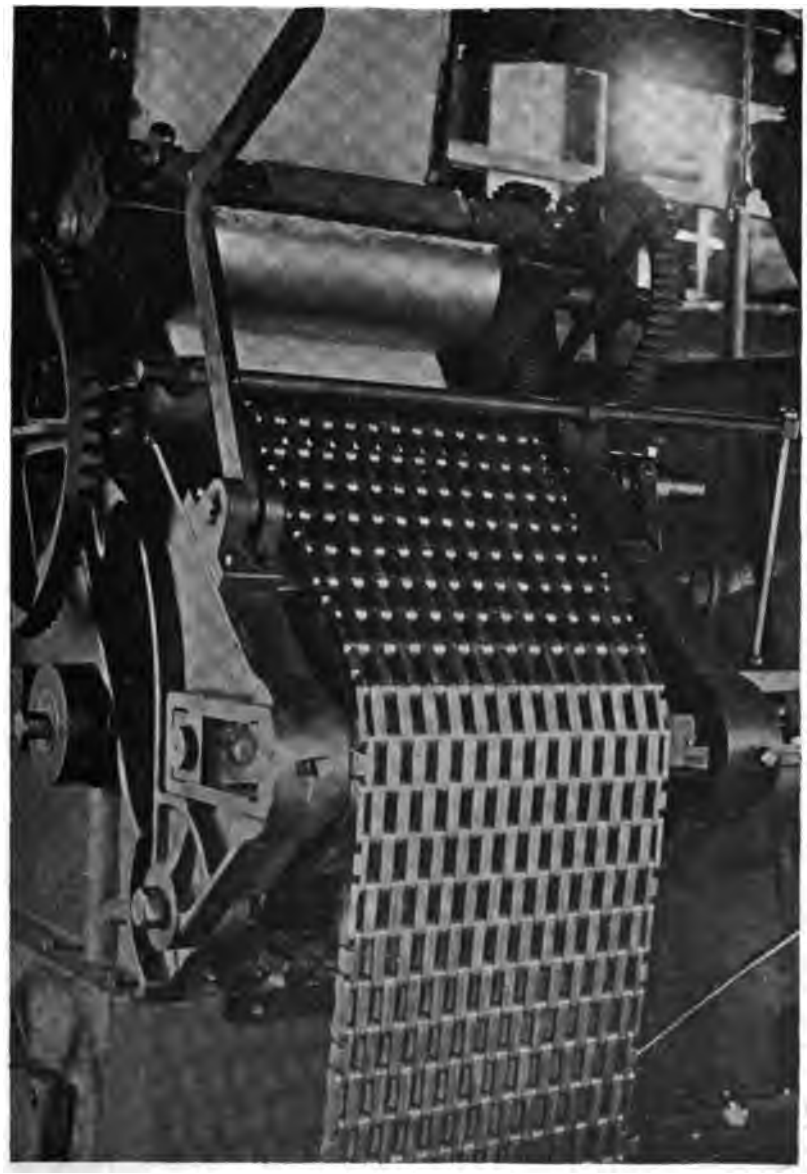


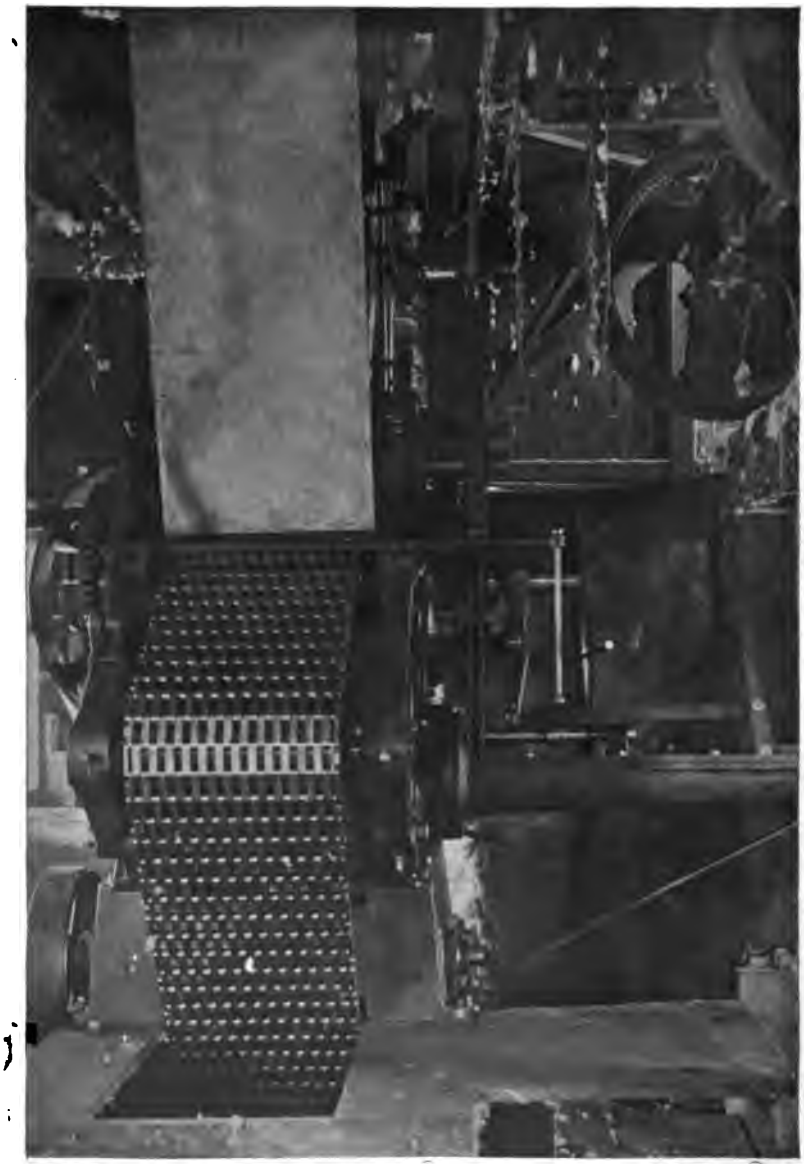
FIGURE 3.



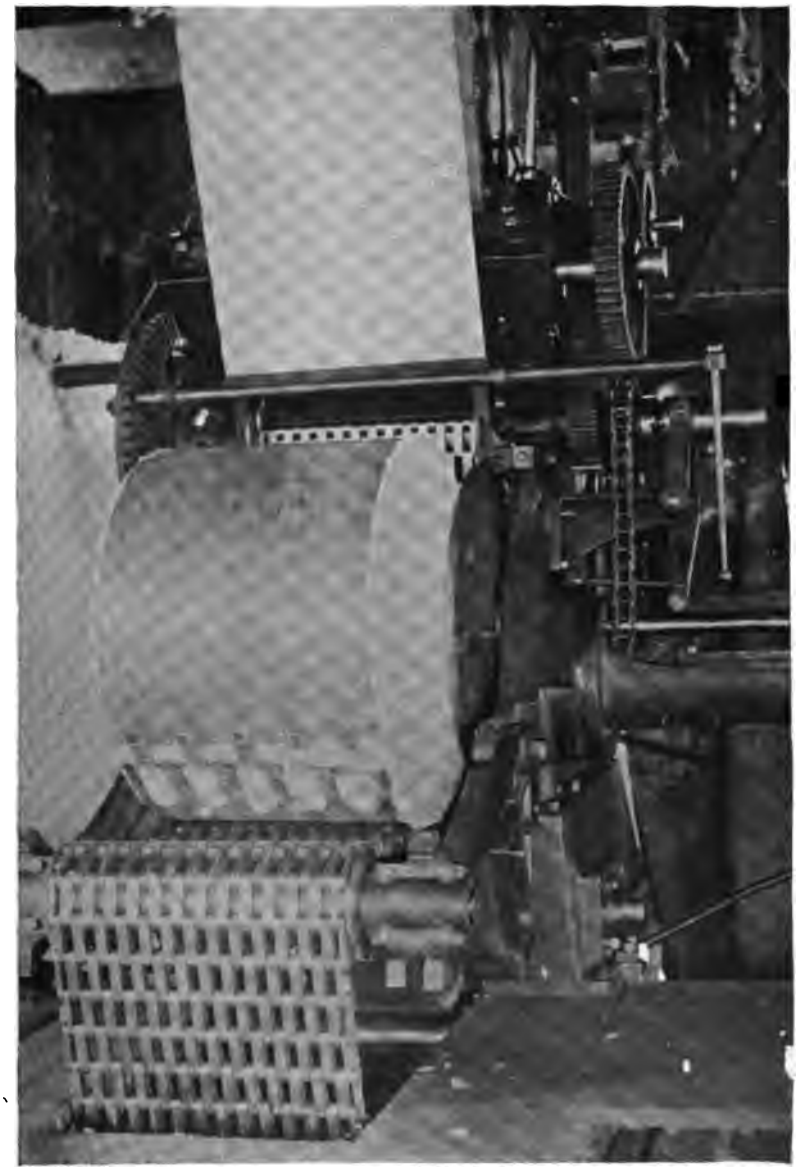
A.—Press ready for commencement of bale.



B.— Press when bale is one-quarter completed.



C.— Press when bale is almost completed, core-shaft is being withdrawn.



D.—Press when bale is being expelled.

The baling rolls are 18-inch cast iron cylinders, mounted in sliding bearings. They begin to bear against the bale when it is 16 inches in diameter and then move backward as it enlarges.

The end flanges are cast iron disks 33 inches in diameter, mounted to revolve in the side frames of the machine and bored to receive the core shaft, which passes through their centers, and normally binds them together.

The swinging arm is simply a part of the machine frame so arranged that it will swing down into position, as shown in Fig. I., to allow the bale to be removed from the machine. The arm is so counter-weighted that it will be pressed down by the weight of the bale without giving the machine a severe shock, and can be easily raised back into its normal position by the attendant.

The mechanism for imparting tension to the baling belt, consists of a tension roller, to the journal boxes of which are attached two vertical racks, which mesh with two pinions upon a horizontal shaft journaled in the machine bed, and having upon its outer end a brake wheel, the motion of which is controlled by a brake band and lever arrangement. The tension in the belt can be nicely adjusted by applying more or less weight upon the brake lever or by moving the weight along the lever. After the bale is completed and removed from the press the tension roller returns to its normal position by its own gravity when the weight on the brake lever is raised and the brake wheel released.

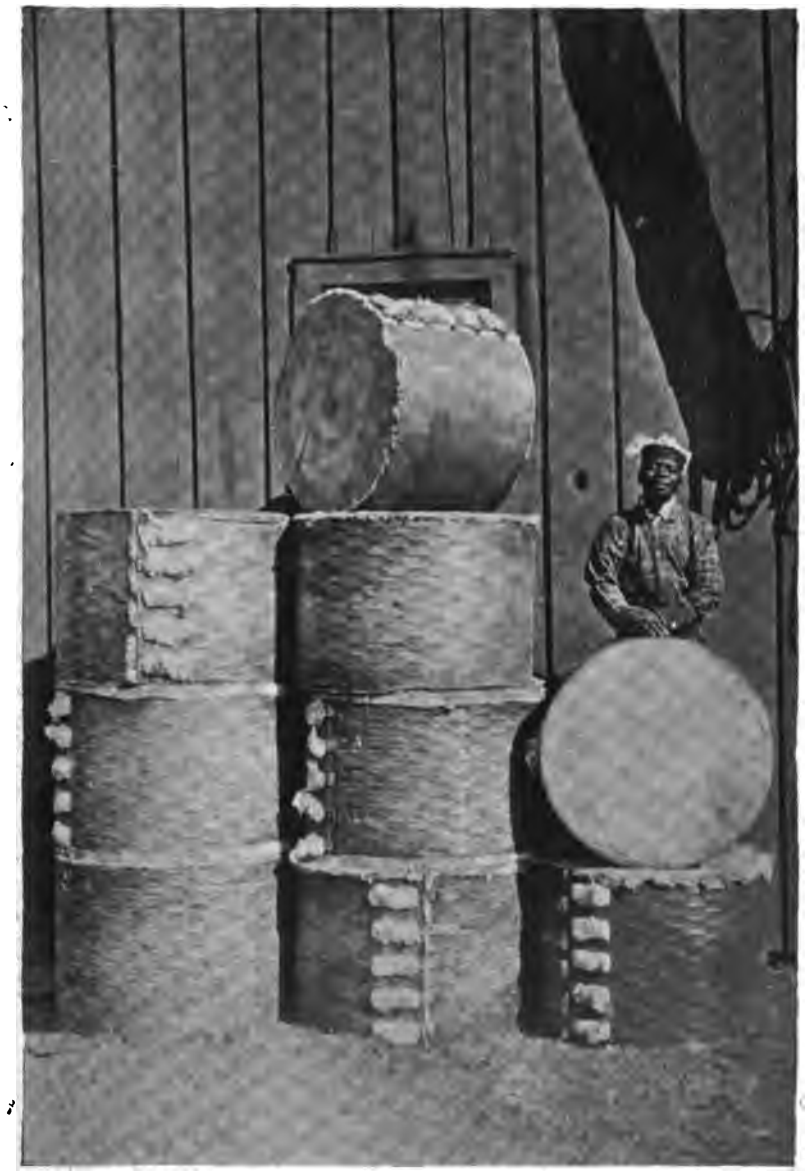
The core shaft is a piece of 2 3-16-inch shafting which extends through the end flanges, and has upon one end a shoulder and in the other a key to enable it to bind the end flanges together and thus release the machine from the enormous thrust that would otherwise be given it as the bale is being made.

The mechanism for withdrawing and replacing the core consists of a screw arranged horizontally and directly below the center line of the core. The screw carries a nut which is connected to the core by a swivel. The screw is connected to the main driving shaft by a sprocket-chain and wheels, the wheel

upon the main shaft being normally loose to turn. When it is required to withdraw the core the sprocket-wheel upon the main shaft is clutched and the screw caused to revolve and drive the nut outward and carry the core with it; when the core is sufficiently withdrawn the clutch is automatically disengaged and the motion of the screw stopped. The core is replaced by the operator turning the hand-wheel upon the outer end of the screw.

These essential parts are mounted in two strong side frames, which are in turn mounted upon a very stiff box bed and strongly held together at the top by a tie ptate. All parts are of ample strength, stiffness, and wearing ability, are simple in construction, and can be easily adjusted and replaced. The machine is entirely self-contained, requires no special foundation, and is as much automatic as it should be for the manner in which it is used. It weighs 12,000 pounds.

Following is a description of its operation: A bat, weighing about 2.3 pounds per yard of length, or 3.5 pounds per square yard, is formed in the batting belts and delivered to the compression rollers, which expel the air; thence it passes down the shute and is wound around the core shaft by the belt. Fig. I. shows this action at the beginning of the bale. As soon as the bale is started, the attendant raises the swinging arm, O, and locks it in its normal position. The bat continues to wind around the core shaft and is held by the belt alone, until a roll 16 inches in diameter is formed. The position of parts at this stage is shown in Fig. II. After this the baling rolls bear against the belt so that the forming bale receives pressure from both belt and baling rolls. During the formation of the first 16 inches of the bale, the only tension in the belt is that due to its own weight, then the tension mechanism comes into play and the belt tension is gradually increased till the bale is completed. The reason that the first part of the bale is made under little pressure is that it has been found that bales made under great pressure at all times have their centres so hard that the fibre is



E.—View of standard 475 lb. bale.

F.—Showing 250 lb. bales.

somewhat injured. This manner of applying tension produces a bale which is approximately of the same density in all parts. When the bale has reached a diameter of 32 inches, the key in the core which holds the end flanges together, is removed, and the core is withdrawn in the manner described. When the bale is 34 inches in diameter, the covering, which is supported in the guide, F, is started around the bale and in one revolution is applied and automatically fastened. The supply of cotton is not stopped while the covering is being applied. Immediately after the tie is fastened the swinging arm, O, is released and falls into its original position, and the bale rolls out upon the floor all complete, except the tie fingers have to be cut off and hammered down close to the surface of the bale. As the bale rolls away, the core is indented into its end sufficiently to stop the belt and is almost immediately replaced into the machine, when all is ready for the commencement of another bale.

The time required to make a bale is, of course, dependent upon the rate of supply of cotton from the gins. When connected with four gins our press will make a bale in 15 minutes. The time required to remove a finished bale and adjust the machine for the commencement of another is so very short that it is found unnecessary to stop the supply of cotton at all.

A sample weighing from three-quarters of a pound to one pound, is drawn from each bale as it is being made and put into a small canvas bag which is fully marked to correspond with the marking of the bale. In order to insure the fairness of the sample several small parts are drawn at regular intervals during the formation of the bale.

CHARACTERISTICS OF BALES.

Photograph E shows standard 475-pound bales. Photograph F shows 250-pound bales.

The special characteristics of our bales are as follows:

Form: Short cylinder with flat ends, length about three-fourths of diameter. This form has been chosen because of the

ease with which it can be handled and stored. The flat ends allow the bales to be stored end upon end in a very stable and compact manner. The great diameter and short length of the bale makes it very easy to roll them about, especially around obstacles, through doors, etc. Where a considerable number of bales have to be moved between two fixed points, as from the storehouse to the opening room, warehouse and ship or car, etc., they can be placed in an inclined trough and allowed to roll by their own gravity. When there is not sufficient incline from the point of supply to the point of delivery, the trough may be built as shown in Fig. 5, a man rolling the bales up the steep leg and then allowing them to descend.

Weight: The bales we are making now average about 475 pounds, and deliver to the mills as much cotton as the common compressed bales which average 490 pounds. We have also made bales weighing 400 pounds and 250 pounds. I think a certain amount of cotton could be handled with less labor when put up in 250-pound packages than in either of the other weights, but I know of no other way of determinating this except by prolonged and actual tests. I should be glad to have expressions of opinions as to the best weight of a bale.

Dimensions: The standard 475-pound bale is 24 inches long and 34 inches in diameter; the 400-pound bale is 24 inches long by 31 inches in diameter; and the 250-pound bale is 18 inches long and 28 inches in diameter. The length of the standard 475-pound bale has been chosen because bales of this length pack with but little waste space in cars and ships, and two of these bales are about the right length for unwinding into European openers. The length of the 250-pound bales, 18 inches, makes them pack well also, and three bales end against end gives about the right width for European openers, while two gives a bat well suited for unwinding into American openers.

Covering and Binding: Our bales are covered and bound by a sheet of No. 28 iron, which has its ends so arranged that they are automatically hooked together in the press. I have here

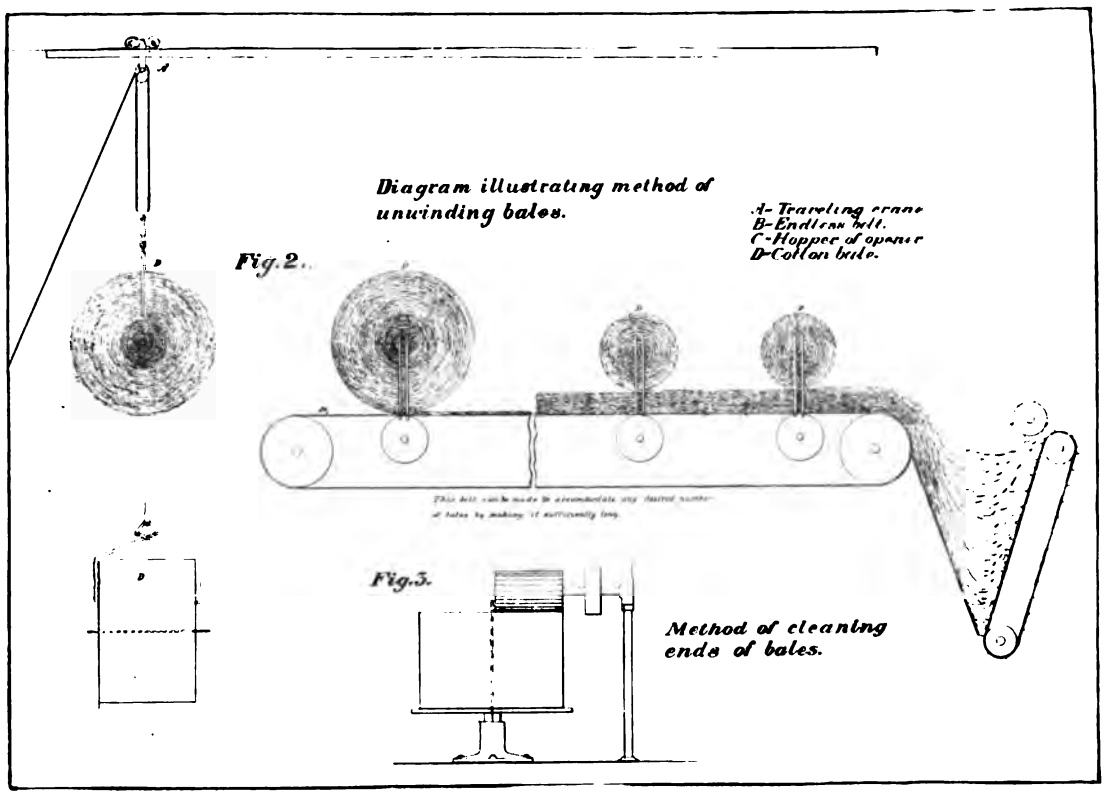


Diagram illustrating method of unwinding bales.
A-Traveling crane
B-Endless belt.
C-Hopper of opener
D-Cotton bale.
Fig. 2.
Fig. 3.
Method of cleaning ends of bales.

FIGURE 4.

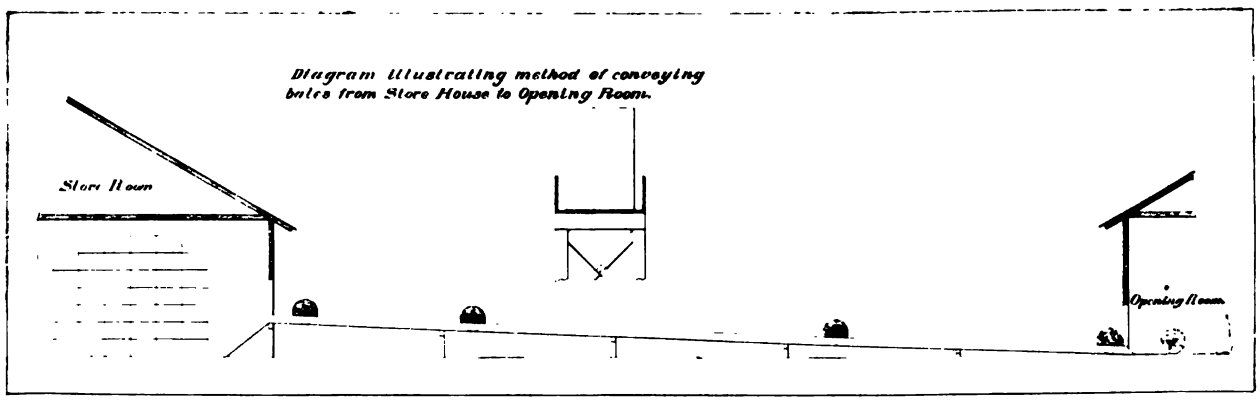


Diagram illustrating method of conveying
bales from Store House to Opening Room.
Store Room
Opening Room

FIGURE 5.

one of these sheets as it is before being applied to the bale. This iron entirely covers the covered surface of the bale and in general practice we leave the ends uncovered, but in some instances we have covered the ends with canvas as shown on the bale numbered 113. We think those end covers unnecessary. Experience has shown that the cotton at the ends is very little damaged by being left exposed. It is, of course, best to pick off the soiled cotton from the ends before opening the bale. A very simple device for accomplishing this is shown in Fig. IV. The covering weighs 14 1-2 pounds, and at the present cost of iron costs about 56 cents; it is probable that the average cost will be about 50 cents. When the end covers are applied, this cost is increased about 20 cents, and the weight of the covering is increased two pounds.

Can be Unwound: These bales are composed of a continuous bat of cotton which weighs when fed to the machine about 2.3 pounds per yard of length. The action of the press causes the bat in a small section near the center of the bale to be somewhat crimped and shortened up, so that its weight there is nearly, if not quite, three pounds per yard of length. It is very evident that this bale can be unwound just as the laps in the mills are. The variation in the bat first appears to be a serious matter, but when several bales are being unwound together in various stages, the average weight of the bats from all bales is approximately constant. That the bale unwinds nicely I shall show you directly by opening one I have here. We think it may be possible to mount a sufficient number of these bales to give a mix of cotton upon an endless traveling belt, and unwind them into the hopper of the opening machines. An idea of such an arrangement is given in Fig. 4.

Some mill men have told us that this is an entirely impracticable scheme, while others, especially in England, have thought it possible. I should be glad to hear expressions of opinions upon the matter.

Fire-proof: The bales are nearly fire-proof; in fact, will not

of themselves support combustion stall. The reason for this is that there is practically no air in the bales, there is no loose cotton about them and their binding is incombustible. Besides this, the ease with which the bales could be removed from a burning building is most important.

Our method of handling cotton in the ginneries greatly reduces the possibility of fire there, for we remove from the seed cotton all things that are likely to strike fire, and should the cotton be fired in the gins the burning cotton would pass directly through the flue and condenser to the press and there be extinguished. (This has actually taken place once during our experiments.) And further, there is never any loose cotton lying around to be set afire by careless use of matches, etc.

The value of this fire-proof quality ean hardly be too highly estimated. It is a matter of the greatest importance to all people interested in the raising, handling, or manufacture of cotton. We believe our bales as well as our method of ginning and baling are as near perfection in this particular as it is possible to make them.

Density and Ability to Pack: The average density of our bale is 38 pounds per cubic foot, and their shape renders it possible to pack them with very little lost space.

The transportation companies allow 30 cubic feet packing space for an ordinary bale, while ours requires only 15 1-8 cubic feet. One hundred and eight of our bales can be packed into a 34-foot box car, which loads it up to its weight capacity, while only 55 compress bales can be gotten in. As I have stated, the density of our bales is approximately the same in all parts. The maximum density is about 42 pounds per cubic foot, while the minimum is about 35 pounds. Many Indian bales are reduced to a density of between 55 and 60 pounds per cubic foot, so with our bales there is no liability whatever of the compression injuring the fibre.

Condition of Fibre: The condition of the fibre is improved over that in the common method in the following points: First,

it is better cleaned; second, it is ginned with less damage; third, the fibres are laid in the bale straight; fourth, all are held nearly in the same state of compression.

Either one of these conditions taken alone is of vast importance. The first means that the fibre is thoroughly dry and is entirely free of cotton seeds and all other heavy solids, and that it contains much less dust and trash than is commonly the case.

The second means that there are fewer *pieces* of fibres and that there are fewer fibres that have been severely strained. The result of this is that a greater percentage of the fibres can be converted into yarn and that the yarn will be stronger and more durable.

The third means that fewer fibres are held in the bales in bent or upset positions.

The fourth means that no fibres are subjected to injurious compression and the cotton opens up uniformally and quickly.

You understand the value of all this much better than I can tell you.

Sampling: A perfectly fair sample is drawn at the time of baling. At present our manner of doing this is, at regular intervals, to pick out small pieces from the bat as it goes into the press. We also have an automatic device which takes a little cotton all the time. This sample weighs about three-quarters of a pound, and is put up in a small canvas bag which is marked just as the bale is, and we guarantee that it represents correctly just what the bale is. No satisfactory sample can be drawn from the bale, but we believe this to be a decided advantage since it prevents mutilation of the bales and the drawing of excessive samples as is now the practice. And it appears to us that the sample which is guaranteed is all that could be desired, as long as responsible parties are behind it.

Waste: It is simply impossible by an ordinary manner of handling to tear any cotton from our bales or to mutilate the iron covering so that the fibre will be soiled. It is equally as impossible to rob the bales, for the ends are so hard that no

cotton can be got from them, and the curved surface is covered with iron. All the cotton shipped from the gin reaches the manufacturer.

When the ends of the bales are left uncovered it is found that from one-half to three-quarters of a pound of cotton at the ends is soiled and should be picked off before the bale is opened.

Following is a tabular statement showing the comparative merits of the cotton bales now commonly in use and the bales ginned and packed by the method of the Standard Circular Cotton Company. The figures given are averages.

	Common Bales.	Standard Cir. Bales.	Remarks.
Original gross weight (upon which freight is paid)	490 lbs.	476 lbs.	This weight includes sample.
Weight of cotton shipped from gin	466 "	461 "	ditto.
Weight of cotton used for samples	2 "	(a) ¾ "	(a) No more can be because none can be drawn from bale.
Weight of covering and binding	23 "	14½ "	
Weight of cotton lost or badly damaged in shipment	5 "	¾ "	
Weight of cotton received by manufacturers	459 "	459 "	Damaged cotton not counted.
Weight of cotton shipped from gin and not received by m'f'rs.	7 "	1½ "	Sample and waste.
Weight of material not good cotton upon which freight is pd.	30 "	16 "	Sample is counted in.
Volume of bale	23 cu. ft.	12.6 cu. ft.	
Packing spool required	29 "	15 1-8 "	
Surface	51 sq. ft.	30.6 sq. ft.	
Shape	Irregular solid with 4 plane sides and 2 curved sides.	Cylinder with plane ends.	
Covering and binding	Jute bagging with iron ties.	Sheet iron.	
Liability to fire	Very great.	Very small.	

	Common Bales.	Standard Cir. Bales.
Condition of fibre	Dirty—broken in ginning; many fibres bent; uneven comp.	Improvement in every particular.
Moving and storing	Difficult.	Very easy.
Opening in mill	Torn to pieces by hand mixed and fed into the openers.	May be unwound directly into the openers.
Av. frt. rate to mills	80 cts. per 100 lbs.	65 cts. per 100 lbs.
Average insurance rate	2 per cent. per year.	1¼ per cent. per year. This includes all kinds of insurance.

COST BETWEEN FIELDS AND THE MILLS.

	Common Bales.	Standard Cir. Bales.
Ginning and baling,	$1.00	$1.00
Covering and binding material,*	.58	.56
Hauling to compress,	.20	.00
Compressing (10 cts. per 100),	.49	.00
Freight to mill,	3.92	3.09
All insurance,	.40	.25
Value of waste and samples at 8 cts.,	.56	.12
Total cost,	$7.15	$5.02
Deduct value of covering at mill,	.10	.00
Total net cost,	$7.05	$5.02

Showing a difference of $2.03 in favor of standard circular bales.

No estimate is made of the value of the improvement in the staple, though this is probably the most important saving of all.

Neither is there any value claimed for the greater ease of handling and the improved manner in which our bales can be opened, though this undoubtedly will amount to something very considerable.

*Without end covers.

Mr. ALBERT G. MARTIN. I would like to ask Mr. ANDERSON, now that he has been comparing the relative costs of preparing cotton by this method and the old method, if he includes superior ginning? Does this constitute any part of this machine?

Mr. WILLIAM E. ANDERSON. Not a part of this machine, but our method of handling.

Mr. ALBERT G. MARTIN. That means the superiority of one gin over another, does it not?

Mr. WILLIAM E. ANDERSON. Yes; but we are making the gin ourselves. We are making the gin and cleaning mechanism, and the whole system of handling cotton.

Mr. ARTHUR H. LOWE. The cost of this machine is excessive is it not?

Mr. WILLIAM E. ANDERSON. The machine that we have weighs 12,000 pounds. We had four machines built by contract at a cost of $860 each. That, of course, does not include the erecting of them in the gins. But the erecting is a very simple matter, because the machine is entirely self-contained. No special foundation is required for them, and the probable cost of erection would not exceed $50. The machines could be put in operation for less than $1,000 at present, and of course when we manufacture them on a larger scale we can make them much cheaper.

Mr. ARTHUR H. LOWE. How does this cost compare with the present method of ginning and baling?

Mr. WILLIAM E. ANDERSON. Most improved cotton presses at the present day cost about $550 delivered. That is for a two box or four box press with steam tramper. Then, of course, to make a comparison, you will have to include the cost of the enormous compress establishments which cost anywhere from $25,000 to $200,000. It is safe to say that if our machines were adopted all over the country the money invested for machines for pressing cotton would be much less than it is now, because it would not only replace the plantation press, but also the exceedingly costly compress.

Mr. H. BARUCH. I am interested in this cotton bale; several of us are interested in the machine known as the picker. I would like to offer as a suggestion—not to criticise this arrangement for baling—but to suggest that some way be devised to do away with the nails in the edge.

Mr. WILLIAM E. ANDERSON. Ordinarily we do not use the nails. The iron we are using now for the tying fingers is No. 16; the iron we have been using is No. 14. We ran out of the 14 and had to use 16, and used the nails in order to prevent bursting in shipment.

Mr. OTIS G. LYNCH. I would ask the amount of power necessary to run the machine in connection with the gin?

Mr. WILLIAM E. ANDERSON. The amount of power, of course, is dependent upon the motion of the machine and this varies directly with the number of gins used. In a four gin plant the power required by the press will average about seven or eight horse power. It starts about five and runs to fourteen. If eight gins, the power required would probably be about fifteen. If two gins, which would be the smallest number we could expect to use, the power would probably average about five or six.

The PRESIDENT. The next paper on the list is "The Improvement in Baling and Handling Cotton," by Mr. D. C. BALL, President of the St. Louis Cotton Exchange, and read by Mr. C. H. BOTSFORD, of Waco, Texas.

IMPROVEMENT IN BALING AND HANDLING COTTON.

MR. D. C. BALL, St. Louis, Missouri.

In the short time that I shall occupy your attention I shall attempt nothing of style or literary excellence, but a plain statement of facts shorn of all ornamentation. When vast interests hang in the balance, action is wanted, not words. The occasion calls for action on your part — prompt and effective. The time is ripe for it, the opportunity offers, the need is great. The question simply is, will this powerful organization now take the stand it should in the interest of its membership and the entire cotton industry? I believe that as soon as you have given the matter consideration you will decide "Aye," for self-interest dictates such a course, and from a thorough knowledge of the cotton business, gained from almost eighteen years' experience in handling cotton, from growing it to delivering it to the mills, I will state calmly and deliberately that, despite the vast interests involved and despite the strength of "conservatism" (to speak politely), that the opposition you would encounter is not worthy of consideration by this body, while assistance is even now, all over the country, awaiting your call.

It is because we believe that this Association is strong enough, brave enough, and acute enough to protect its own interests, that my friends and myself, who have for many years past reaped a profit from a portion of the — I will frankly say — useless and exorbitant charges connected with the present old-style system of marketing cotton; it is because of our confidence in your ability and judgment, that we have taken the stand for reform

and invested our time, experience, reputation and money in it. The question simply is, are you going to share in the benefits of it, or is the foreign spinner *only* to get them?

Before proceeding to the facts, I will make one plain, direct statement, and that is that the "Improvement in Baling and Handling" that I shall now set forth, will do more to remove any and all of the disadvantages that you may suffer as compared with the rapidly increasing southern mills, than anything else that can be done — immeasurably so. I repeat that statement — bear it well in mind,— the new method of handling cotton will remove sufficient of the disadvantages under which you suffer as compared with the manufacture of cotton goods in the South, to enable you to regain any ground you have lost. If you question this statement as to the advantages of the southern mills in their direct purchases without paying all the useless charges of the old-style system, I will simply cite the case of a mill in one of the southern cities where one of our plants is located. We had a large amount of loose cotton which the rush of business did not permit of our running again through the pickers and baling up. With middling cotton in New York quoted at nine cents, the mill, for this early picking, fully strict middling 1 1-8 inch cotton, worth 9 3-8 cents in New York or New England, would pay only 9 1-4 cents, claiming — listen to this — "allowance of 1-2-cent per pound, because it would cost us that to bale it." They were buying all their requirements on that basis, and we had to either sell to them or add on to it all those charges and sell it to some of you gentlemen for about 9 3-8 cents, which is what we did.

It is unnecessary for me to take up your time, or my own, in a discussion of the present system of baling and handling cotton. Words fail to express the opinion of those who, like yourselves, are conversant with the facts. The one great laggard in the universal progress of modern business methods is cotton. Thousands have discovered it and are reaping the harvest that does not rightfully belong to them. They do not advertise it

to the world, but the business "crime," it might almost be said, would not admit of longer covering it up. The cry has gone forth and the world knows of it.

To the Department of State at Washington, nearly two years ago, I applied for certain information. The result was the publication last May of the reports on baling of cotton, which astounded the press and public generally by the magnitude of the evils of the system. Since then newspaper and magazine articles in endless quantities have spread the information, until to-day the evil is recognized and the cry for "reform" is heard from all sides. Yet those consular reports and the newspaper articles scarcely more than touch the surface of the facts.

If there is any one who wants information on the subject, as far as published, the "literature" in large quantities can be supplied him. I believe one quotation on my part is all that is required now. A recent number of the "Review of Reviews" says: "It has long been known that the wasteful system of cotton handling employed in our Southern States has been the cause of enormous loss to the grower and producer as well as to the buyer and shipper. Mr. EDWARD ATKINSON has described the American cotton bale as 'the most atrocious, barbarous, unsafe, wasteful and unsuitable package in which any great staple of commerce is put up anywhere in the world.' The present baling methods leave the cotton very absorbent of water, grease and oil and ready to ignite from the least spark. The *Manufacturers' Record* of Baltimore gives an account of a new process, known as the Bessonette system, which seems to obviate many of the confessed disadvantages of the old style of baling," and then follows a considerable portion of the most excellent article referred to. But, after all, that (and all other articles practically) takes account almost solely of the manifest savings in compressing, freight and insurance, and incidentally the covering question also is touched upon.

Now, if you will allow me to refer you in addition, to the excellent report on the insurance feature that was made by the

Special Committee of the South Eastern Tariff Association, I shall take it for granted that the evil in all its magnitude is known to you far better than to the public generally, and that from your knowledge of these evils and your bearing so considerable a portion of the losses occasioned by them, that you are ready and anxious to do away with them, if that can be done, and with profit to yourselves.

Now, for all the old-style, cumbrous, wasteful system, with its multitude of charges, wasteages and stealages, there is substituted by the "Bessonnette System" the following simple, direct handling from the planter to the mill. All the Bessonnette patents have been assigned to The American Cotton Bale Improvement Co., which, with ample capital and broad experience, is putting in plants as rapidly as possible and handling the outturn of cotton.

Preferably by uniting with the local ginner, who possesses a large plant, proper machinery is put in, ample capital supplied. the cotton bought in the seed, by a carefully devised system of checks and records the grade and character of each load are determined and its proper disposition secured and results known. The cotton is drawn by suction from the wagons and cars, blown through cleaners and distributed to the proper storage bin. Thence in due time it is drawn by suction to the cleaners and distributors and the gin; from the latter it is blown into our special condenser room, some 50 feet in length, where by a traveling belt floor, a system of screens, levelers and pickers, it has all possible dust and foreign substances removed and it passes out in a continuous bat 66 inches wide and, at will, from 4 to 12 inches in thickness. This bat is fed between compression rollers which exclude practically all the air, thence it is wound directly, under a pressure of about 1,000 pounds per square inch, around a 3-inch steel wave-screw core, which revolves between two rollers, one of which yields to the increasing size of the bale as each layer is wound on, the pressure being regulated at will. A sample of this bat, whose even running

character is guaranteed by the system, is drawn as the bale is in process of rolling, and in this sample is inserted the number and mark which is to identify the bale clear through to the mills. On this sample, which is forwarded to the central office, and its grade and character carefully determined, the bale is sold directly by the company, through its representatives or agents. Thus the grade and character is guaranteed, its manufacture being in the hands of the responsible seller, who is bound to the spinner, and thus also is removed all necessity for cutting the bale and exposure to loss and damage, and all necessity and opportunity for useless handlings and expenses and additional middlemen.

This sample is split in two when the bale is sold and one-half is retained by the company, with the tag identification card still in it, and the other half is forwarded to the broker, or representaiive, as usual; thus the mill gets an actual sample of each and every bale, which sample was drawn from the bale while in course of making.

The bale itself, when it reaches the proper size, has applied to it still revolving under pressure, a 15-inch wide strip of cotton duck, which is wound on spirally and the end fastened by a stitch or two. The bale is then rolled out and secured on a truck and the steel core is removed; in the meantime the duck covering for the heads is fastened on, either simply sewed on to the duck side covering or slipped over the end edges of it and tightened by a wire inserted in the hem of the cap. Which of these plans is finally adopted the experience of this season and the preference of the mills will determine. The bale is then weighed, marked, numbered, and the trade mark and guarantee label placed upon it, and it stands a complete bale of cotton, already sampled, its even running character and freedom from false packing pre-determined by the system and guaranteed by the entire resources of the company. It weighs on the average 500 pounds, of which 4 pounds in case of sewed heads, or 5 pounds in case of wired heads, is tare, and 496 or 495 pounds

is net cotton, clean and dry, and entirely covered by cotton duck, and practically fire-proof, and the density being at will from 30 to 36 pounds per cubic foot, and the bale ready to load to the full capacity of the cars, it being possible to regularly load 46,000 pounds in the standard 34-foot box car. Thence follows the loading and shipment by the cheapest route to the port or central warehouse, en route to the mills, at which "concentrating" point it is sorted according to grade and character determined by the sample as previously described, and as so assorted it is either forwarded direct to the mills at once or when wanted.

Contrast this direct, simple, responsible and economical system with the present round-about, complicated, irresponsible, and utterly wasteful manner (it is not worthy of being called "system" or "method"), and I believe there is not a member of this Association that will not join heartily in furthering the introduction of the new system.

Of course we expect to profit by these savings, but it is a narrow man who does not see in this method not only our rapidly dwindling profit and the vast saving to the producer, but also the great advantages and profit to the American spinner — a little consideration, and it will be evident to even such a one.

With a description of this round bale at the mill and I am done with the "facts." Standard 34-foot cars can nearly always be secured. If you will take the cotton in 80-bale lots it will go through in straight carloads without breaking bulk and in completed lots. Nothing more need be said to the man who is forever struggling with "shorts" and "overs." With no re-handling, as well as from the method of covering, better weights are assured, and from these causes also the loss from stealage, wasteage and "country damage" is done away with. The insurance saving, both in transit and at the mill, is great in the aggregate, and what is of more importance, is the far greater safety to the mill,— no loose cotton, no flash hazard and a scarcely combustible stock. The saving of storage space is

enormous, and a consequent money saving. The same guarantee goes with the cotton as under the old system, and in the case of the new there can never be any question as to the value of that guarantee, but what is of greater value still is the guarantee of the system itself of practically no necessity or opportunity for claims.

Notwithstanding its heavy compression and close covering, the sampling of the bale is a simple matter, preferably by removing a head, while the end of the bale itself affords a means of examination, through all of the whole length of bat being exposed, such as no examination possible under the old style could afford. Remember that the machinery itself makes false packing, water-pack, etc., impossible, to say nothing of the responsibility attaching all through.

Last, but by no means least, is the opening of the bale, which is more easily handled than the old bale. At whatever period is desired the heads are removed, a one-inch, sharp-pointed iron rod is driven through the centre (from which the 3-inch core was extracted at the press) and by a simple runway, blocks and hooks one man picks up the bale and deposits it in position on an unwinder. There are half a dozen simple devices that answer for this. Each mill superintendent seems to prefer his own way. Perhaps the simplest is a belt 66 inches wide resting upon rollers about three feet apart; above these rollers two rods at each end, between which, when the bale is let down, the ends of the iron rod in the bale rest, so the bale can revolve with the belt, but is held in place as the belt moves forward. First the strip of duck covering comes off and then the cotton itself unwinds in a continuous, smooth bat, scarcely ever with any difficulty, unless it be when down near the centre it becomes too light to roll, when a boy can in a few moments slip the loose pieces from the rod and into the opener, while another bale takes its place. If it is desired to mix the cotton, then two, three, or a dozen or more bales are placed one behind the other, over the rollers on the belt, and as they unwind one folds in under the other and they

come out more evenly mixed than is possible by hand. The number of openers or pickers that can be fed thus by one man and a boy is determined entirely by the speed of the belt, as the cotton, either single bat or mixed, is carried by a simple apron direct to whatever machines it is desired to feed. A careful estimate by the superintendent of a large eastern mill was, that with the runway, unwinder and apron, one man with a boy could get the cotton in the storage house, insert the iron bar, deliver the cotton in place on the unwinder, and there remove duck wrapping, unwind and deliver the cotton to the machines at the rate of 100 bales per day.

For those who prefer to air their cotton before using, this bale offers the best of opportunities, as, if unrolled upon the floor and allowed to remain over night, the bat rapidly swells out to a thickness of three to four inches.

Now, I have not taken up your time in order to induce you to buy our cotton. I believe that with our success there will be others who, with equally advantageous means, will adopt the general principles of it, so that the improvement in baling and handling is assured. It is simply a question of how rapidly it shall be introduced.

With the present tremendous establishment and interests fighting for the old system, the question as to whether or not there is to be an *immediate* improvement in the system of handling cotton must, after all, rest with the spinners. If they are entirely satisfied that the present wasteful and irresponsible system, which in many of its aspects is simply a lottery as regards the character of the cotton that you get, is better than having that end of the business laid out on the same lines as the business is handled from the time the cotton is opened at the mill, then there is no immediate opportunity for improvement.

The present system encourages the farmer in every possible effort to work in a fraudulent cotton bale; it encourages the ginner to further the effort of the farmer; it encourages both to add on, by every possible means, as much tare as they can, for

it is a fact that examination will prove, that the heavier weight bagging as now made, means added tare without added protection. It encourages the army of irresponsible—what are termed "stem-winders" in the South, to use every possible means (often more illegitimate than legitimate) to screw a profit out of the cotton at the expense of both the farmer and the spinner. It encourages every possible means of stealing from the bale, or adding to its charges. It encourages the very worst compressing that can be smuggled through; it encourages the highest possible freight rates; and it encourages that equally vast army of irresponsible buyers that, partially through speculation and often largely through misrepresentations at the expense of the mill, make more out of the cotton than probably the mills do themselves. It encourages the putting into a bale of cotton of all possible dirt, sand, etc., and of all the miserable, low, short, fluffy lint that ought never to get beyond the gin-house, and a portion of which, in one shape or another, you are forced to take from the cotton, and the balance of which tends to lower the value of the remainder.

If you want a change in this system, if you want absolute reliability as to the character of the cotton and responsibility as to its handlers; if you want cotton put up in the most economical manner possible and all useless expense cut out; all foreign substances and inferior grades of cotton removed as far as possible; if you want all useless middlemen removed so that with one handling the cotton passes from the farmer to the spinner; if you want to buy net cotton without having to figure on that unknown and ever-varying (and as a matter of fact ever-increasing) quantity, the tare, then you must encourage the new system by yourselves coming into the market and buying the cotton.

The new bale does not ask for charity, but simply recognition. If this Association will but take the stand that its members will buy *net* cotton only, requiring deduction for whatever tare there may be, it will be a long step in the right direction, and as is self-evident, will greatly simplify the problem, and fix firmly for the future the manner in which cotton shall be wrapped.

If you buy a 500-pound bale of cotton, old style, and count on 22 1-2 pounds tare, and find that you have 30, or near it, the result is evident. On the same basis, if you buy a new bale weighing 500 pounds, which has at most 6 pounds of tare on it, you cannot expect to get 494 pounds of net cotton at the same rate per pound that you bought 500 pounds of (usually this year 28 to 30 pounds of) practically worthless tare and 472 pounds of cotton, illy protected and frequently seriously damaged to the extent of several pounds.

Remember that the organizations that are trying to introduce the improvement must buy cotton from the farmer on the basis of his selling bagging and ties at the same price as the cotton, as that is the way you pay for it; and so in buying the cotton, when we buy 1,500 pounds in the seed, we have to figure against an out-turn in the old way of 500 pounds, of which actually only 470 to 472 pounds is cotton; so when we get 470 to 472 pounds if we would simply add our 6 pounds of tare on it, our 476 to 478 pounds would be worth as much in net cotton to you (leaving out all consideration of added value in our case) as a 500-pound bale under the old way.

These facts could be enlarged upon in many ways. You see the principal points.

The question simply is, are you willing to continue to take the chances from the irresponsible buyer who undersells the market to your competitor and thus forces you to buy from him, with the result of losses sooner or later; or are you willing, as we started out by saying, to have this department put on an exact business-like basis the same as the rest of your manufacturing?

The question must be decided by *you* and this meeting can largely determine it. *We* dare not take the stand for net cotton; *you can* and *should*, for the new bale *can* add on thirty pounds of useless tare just as well as the old.

The PRESIDENT. I am informed that Mr. W. T. BESSONNETTE the inventor of this system is here, and I will ask him to explain his method.

Mr. W. T. BESSONNETTE. I will take a very few minutes of your time. I simply want to explain a few of the principles. This machine is constructed of iron and steel and practically not a wooden piece about it. It sits on a foundation, preferably made of cement and brick; otherwise we could put wooden blocks, but we prefer the other on account of being more substantial. The machine weighs about 30,000 pounds. The rollers are 40 inches in diameter and are hollow.

A steam cylinder is directly connected to this roller. By a reducing valve we can place any amount of pressure on it that we desire, from one to 40,000 pounds. We can make cotton from 30 to 60 pounds density to the cubic foot if desired. Now when the cotton, referred to by Mr. ATKINSON, was shipped, we were winding the bales on a two-inch gas pipe. At the present time we have a two and a half inch steel core. After the bale is finished the core is unscrewed, leaving nothing whatever fnside the bale. The cotton is formed into a bat six to twelve inches thick. That bat is carried under the compression roller twelve inches in diameter and pressed to the thickness of about 1-16 of an inch. It comes forward, and this large roller being down on the core, the cotton is wound around that, and as the cotton winds the bale increases in size until the roller rises to the required height, say 24 inches. We can stop these bales at 500, 510, 520 pounds. We can vary them as we see fit. After the bale is completed the canvas duck is put under these rolls and wound around the bale of cotton.

Mr. T. H. SMITH. What is the diameter of the bale?

Mr. W. T. BESSONNETTE. About 24 inches in diameter.

Mr. T. H. SMITH. How many times do you wrap the canvas duck around it?

Mr. W. T. BESSONNETTE. About six times. It is put on just as you would put a bandage on your arm. I will state to the Association that we had cotton that was lying on our plat-

form last October, one year ago, and it was sold in June of this year, and the cotton was not wet and had been there through a severe winter. No moisture enters it regardless of the weather.

Mr. STEPHEN N. BOURNE. Did it stand in the rain?

Mr. W. T. BESSONNETTE. Yes sir, all the winter; and we had a severe winter in Texas.

Mr. FRANCIS E. SAUNDERS. I would like to ask how much pressure you get on the roll of cotton, and if it will readily unroll?

Mr. W. T. BESSONNETTE. At the beginning, the first bale we shipped to Boston (we shipped 112 bales at that time). We wrapped this bale on a two-inch gas pipe, and at that time we put just as much pressure at the beginning as at the last, and after we got to the mills with these bales, we found that the last six inches would not unroll satisfactorily. After making this improvement in the core we then began with only the weight of this upper roller, which weighs 5,000 pounds, on the bale at the beginning. When the bale became six inches in diameter we put about 1,000 pounds on the cylinder and gradually raised the pressure, giving 25,000 to 30,000 pounds at the termination. After we got the steel core that relieves the tightness of the bales on the inside, I will state that our bales generally unwound to the core without trouble. We are using a thicker bat than we did at that time, which is necessary to have the bale unwind to the core.

Mr. STEPHEN N. BOURNE. Is there any chance to get any indication of water?

Mr. W. T. BESSONNETTE. Dampness will cause the cotton to adhere to the rollers so you could not work at all. I will also say that we have often swept out a bushel of dirt that has fallen out of the lint cotton as it was handled.

Mr. STEPHEN N. BOURNE. Is that not going to make it pretty hard work for you to introduce these machines in the South? these people would rather sell that.

Mr. W. T. BESSONNETTE. We are depending on you people to help us out with that.

The PRESIDENT. The topic of the next paper is "Baling and Compressing Cotton," and is by Mr. JEROME HILL, of St. Louis, Mo.

BALING AND COMPRESSION OF COTTON.

MR. JEROME HILL, St. Louis, Mo.

When your Association requested me, through your worthy Secretary, to prepare a paper on baling and compressing cotton, I naturally inferred that he desired me to tell all I knew upon the subject. You will be relieved when I tell you that you shall not be detained long to have this information. Had he requested me to write what I didn't know upon these subjects, I would have worn out several stenographers and the patience of your good selves.

The baling and compressing of this raw material (cotton), one of our largest home consumption and export products, is unquestionably a matter of the greatest interest to the producers, manufacturers and transportation companies.

As a prelude to this paper, it might be well for me to here state that I was born in Mississippi, and a slave-holder. The latter I had nothing to do in the making of, and I thank God that it went with the reunion of these States.

I saw a spinning jenny once; it was not used save as an heirloom down on the old plantation at my father's farm, Longwood, in Mississippi. We read that this machine created a great interest in the commerce of the world at one time. It had then been supplanted by the Whitney gin. Our horse gin and screw lever press were among the first so-called enlightened improvements of mechanical progress in those days of slavery. I was

brought up to work, picking cotton in the field, driving the mules to run the gin plant, and packing the cotton in the old wooden screw press are my first recollections of having given a helping hand to my good mother after my father's death.

"I mowed and hoed and held the plow and longed for one and twenty."

This was nearly half a century ago, and yet I can see now with my boyhood's delight, the coming of our "tinkling herds," our flocks of sheep, the return of the darkies from the field at dusk, and hear their melodies. I see the jig-dance after the housing and feeding of the stock, in the moonlight, and I don't forget the welcome of my good old colored mammy, when she would see to it that I had the best that the larder afforded. These are pleasant memories to me, and the vision of the old plantation is as dear to my heart as are the rock-ribbed hills of New England to yourselves.

The gin plant, as I remember it, was not one to be forgotten. It consisted of a 60-saw gin, very simple, a room adjoining where the cotton was carried from the gin through a short flue, into the so-called pick-room (as it was termed). Our elevators were our shoulders, and we condensed our cotton in our arms, carrying it from the pick-room to the "wonderful" lever screw press. This gin and press were really the wonder of our people, and at that time considered the heighth of civilization in Marshall County, Mississippi. Improvements have undoubtedly been made in the gin, but these saw gin machines that take the cotton from the seed have not kept pace with the spindle that has made it into cloth; in fact, the old master was too busy studying the art of increased cotton acreage to give any attention to inventions. Nearly all the improvements made in this line have dated since the war of the Rebellion. He had the climate and the soil to lead him to agricultural pursuits, whilst your good people in New England, having no soil but barren rocks, turned their attention to inventions and improving machinery; thus we had a wonderful growth in cotton manu-

facturing improvements, and a slow one in cotton ginning and baling during that period. The cotton press, so-called, consisted of a structure made of post-oak, with two long levers to give power to the pressure, a trunk of a post-oak with threads cut on same fitted through a block with corresponding threads; to the bottom of this screw was attached the follow block. This block was raised by the aid of a mule to the levers. The cotton was conveyed in arms or baskets to the press, tramped in by the darkies, and then the mule would do his work of pressing the cotton down to the dimensions of the old cotton bale. It was then covered with hemp bagging and tied with hemp rope raised in Kentucky and Missouri. The press was usually built one-third under the ground, and after the bale of cotton was securely covered and wrapped, it required several hands to roll the bale from the cotton box to the yard above. All of this was a tedious, laborious undertaking, but it was not so considered at that time, and we must remember that we only produced then about two million bales of cotton annually.

The Whitney gin invented one hundred years ago, has proven a boon to humanity, being instrumental in clothing the poor of the earth; in fact, it has made cotton clothing the great substitute for fig leaves in all countries, but it has, in my opinion, served its purpose, and I now believe it will soon pass and be succeeded by new and improved inventions, in fact, I agree with Mr. EDWARD ATKINSON, that the saw gin should be laid aside, and that improved methods should be used for taking the lint from the seed without cutting or destroying the fibre. This can and will be done. Already I have seen little model roller gins. They are not a success as yet, in fact, did not work satisfactorily; but I have noticed that when man's mind is directed toward a desired improvement his genius is equal to the wants of man, and in turn the "Yankee's" perseverance and skill overcomes all obstacles.

Concentrated ginning and pressing has grown rapidly in the South for the past ten years. Steam gin plants are everywhere,

and the presses are almost perfect in making the old square bale. Many of them are very convenient and well adapted for practical use in putting up this form of bale, covered with India jute and English iron ties. This concentration has aided much in improving our plants. One public gin plant now takes the place of half a dozen old, worn and badly equipped ones. This has brought competition, and competition has brought improvements, and we have had some beneficial results; for no gin and press can succeed if it fails to have improved gin stands, elevators, condensers and seed carriers.

THE WEIGHT OF A BALE OF COTTON.

We see from our government reports that the weight of a bale of cotton has grown year by year with our increased crops. In 1791 the American cotton bale averaged 225 pounds; in 1801, 228; in 1811, 237; in 1821, 278; in 1831, 341; in 1841, 394; in 1851, 416; in 1861, 477 pounds net cotton. If you will notice that from 1865 to 1871, after "de wah," the weights dropped back to 442 pounds, and gradually increased until 1891 to 473 pounds, net cotton. This discrepancy can easily be accounted for, when we consider that when the war was over the cotton presses throughout the South were in a most wretched condition; hence, the making of the bale was necessarily light. But the question comes up, why was the weight of a bale of cotton in one hundred years increased from 225 pounds to 475 pounds net cotton? It could not have been to protect labor; for the handling of a bale of cotton of 470 pounds is a very laborious performance, while the 225-pound bale could and certainly was easily handled and transported. My explanation for this is that it was the natural bent of man to save and make money. The freight upon a bale of cotton upon the Mississippi and the other tributary streams of the South that transported all of our cotton to the seaports prior to the advent of railroads, was *so much per bale*. If the rate from Memphis to New Orleans was say, $2 a bale, the farmers were quick to see that if

they made their cotton heavier they were saving greatly in the freights, and this custom has prevailed until the present day. 475 pounds of net cotton with the bagging added, gave them a 500-pound bale of cotton. Our railroads have in nearly every instance accepted this old custom in making their tariffs, save on compressed cotton. This latter is invariably shipped per hundred. I am of the opinion that this was a grave mistake of our early cotton producers; for in this way they made a bale of cotton too voluminous to put inside of a house, and if it was and caught afire, it not only endangered the buildings, but the lives of the family. If it was put out-doors in the weather. we who have handled such cotton know but too well that somebody paid for its rapid decay or rotting. Mr. EDWARD ATKINSON used the proper word for describing it when he called it "heathenish." I have claimed and still claim that a bale of cotton should never exceed 300 pounds in weight, because it is more convenient for the manufacturer, producer and transportation companies to have these bales made to conform to some extent at least to the merciful consideration of the laborer, and with the strength of a man, enabling him to easily handle and store it away in our warehouses, and on board railroads and steamboats.

FIRE IN COTTON.

To one who has lived in the South for half a century, the thoughts of cotton burning has, from sad results, brought with it a shudder of horror. The burning of steamboats on the Mississippi, Red, Ouachita, Tombigbee, and the other southern streams, the great destruction of cotton shipped upon the ocean were of frequent occurrence, prior to the advent of compresses and railroads. The losses to life and property were beyond enumeration. The railroads have greatly reduced these calamities, and the Morse and Taylor presses have added their share and in a large manner protected the ocean steamer. Of course the steel hulls superseding the old wooden bottoms of steamers

have also saved thousands of lives and cargoes crossing the sea. It is gratifying to me that I have lived long enough to cease to look for the sad afflictions that so often, prior to 1870, visited our southern homes.

IMPROVED PRESSES.

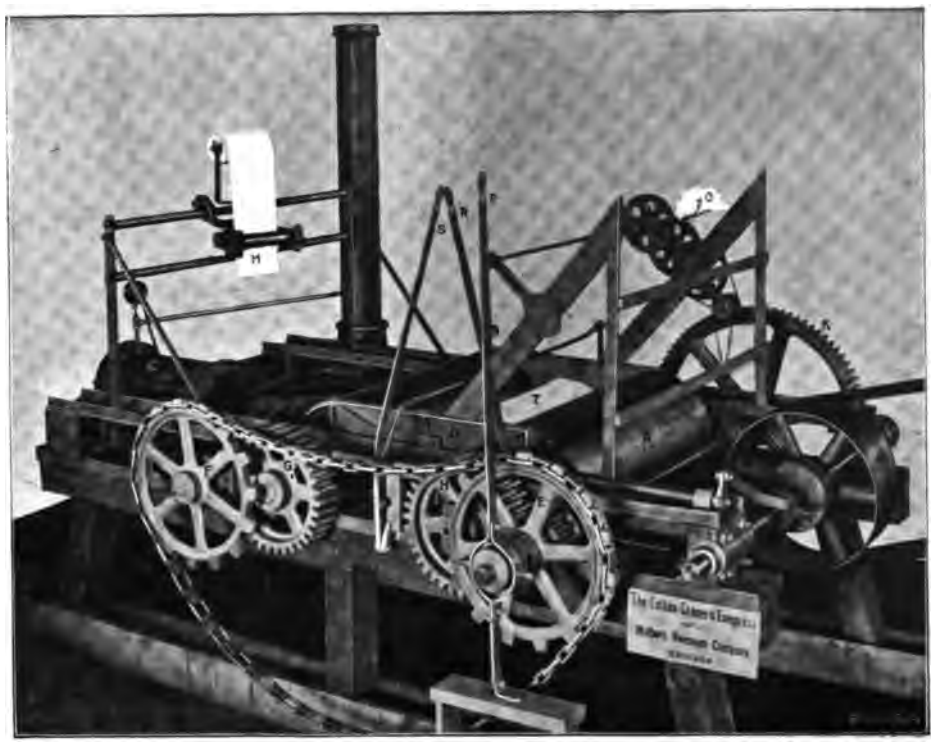
When the present used compresses were introduced, I well remember the many objections raised to them. It was claimed that it would surely destroy the fibre of the cotton; that they were unweildly, and too costly to be successfully operated, but results have proven that the first objection was unfounded to a large extent, or at least that it so far protected the interests of commerce that the damage done was overcome by the profitable results, but there can be no doubt but what the second objection was well founded, for they are not heathenish, but are modern mechanical monstrosities. The extra freights for the hauling on this cotton to feed these presses, the storage, the insurance, and drayage has cost the South millions, to say nothing of the opportunities afforded for gratuitous sampling. Now, one of these bales must have the same old iron ties that we have mostly purchased in Liverpool, and the same jute bagging that our people have purchased in India, manufactured in our mills, and then paid the freight on to the southern gin, and then re-shipped to all the markets in America and Europe, to the cost of both producer and consumer.

It, too, has served its purpose, and we now come to

A REVOLUTION.

We have lived to a time that men will tell you and ask you to believe it, that they have a new process of baling and compressing cotton that will produce a bale that fire will not consume, and that the sea cannot water-log; that it will neither absorb nor throw out moisture; that it will not gain or lose in weight. It is called the cylindrical or round bale — a solid roll of cotton. This is not an experiment or theory, but I assert to

you it is a successful reality. It is as sure to revolutionize the handling of cotton and change our present methods of trade as that the old screw press has gone out of existence. The advantages of this process are numerous and no one can dispute them. It is advantageous to the farmer, for he saves one entire handling, and from three to four "goosings" or samplings. It surely should save him the estimated 50,000 more bales of cotton that were shipped out of our cotton centres than were shipped into them, conveniently called "city crops," that were produced without the sweat of a man's brow, or the turn of his wrist, and will place every station on a parity as to freight. It is advantageous to the transportation lines, especially the railroads, for where only 22 bales of the old flat cotton could be stored and transported in an ordinary box-car, and 42 to 50 bales of the Morse-Taylor Compress cotton, 70 to 80 bales of this cotton, weighing 40,000 pounds (or the car's full capacity), can be easily transported from the fields of the South to the spinners of the East. It will be beneficial to the manufacturer also, on account of a great saving in room for storage. The manufacturer also saves the freight on 24 pounds of dead and useless bagging and ties. He receives just what he buys, and the old jute and iron tie covered bale, as you well know, has 24 pounds of iron and jute covering. Two pounds is usually docked, leaving 22 pounds that he must include when he makes his estimate of the output of this bale. Under the new process there should be no dockage for the covering, as 8-ounce osnaburg is used, and it should at least be worth its weight in raw cotton, for it can certainly be utilized in the clothing manufactories throughout the country. It will save to all in insurance; for the rate should be reduced in accordance with the risks, which experienced men claim are not more than one-half of what the insurance underwriters claim they were under the old process. I am pleased to be able to state that the Southwestern Railroad Association has given this cotton the lowest compressed freight rates, but I hope they will do better still: for the old flat bale had a density of only 10 to 12 pounds to the cubic foot, the Morse and Taylor pressed cot-



The Cotton Ginners' Compress.

ton has a density of 22 to 24 pounds to the cubic foot, while this cyliudrical bale made under the new process has a density of 35 pounds to the cubic foot. One of the largest cotton dealers in New York, a few days ago — a man whose firm is known throughout the cotton industry of the world — after having carefully examined one of these cylindrical bales compressed at Greenville, Mississippi, stated that if he was a cotton spinner he would buy no other cotton if he could be supplied with a sufficient quantity from this new system; that it was all cotton, no wastage, no loss in weight, no paying for 24 pounds of dead freight, or the same amount of useless bagging and ties, that had been purchased in Europe, shipped to the South, sold, resold, and again shipped back to the eastern mills or to European ports to the cost of the producer. This is all on American bales of cotton. Please remember that if it was to our advantage, we could easily cover this cotton with jute bagging and ties, and still have the advantage of having saved the compressing and the farm baling.

The government had our consuls report the condition of American cotton and to make comparisons of same on arrival in different ports of consuming countries in Europe. As you well know, every single report was detrimental to our present system, but I am glad to assert that under this new cylindrical process we move from the position of having the worst ginned and compressed cotton, to the front, and to-day we can and will make the most satisfactory and the best protected cotton bale ever produced in any nation or clime, both for transportation and consumption. It may, and doubtless will, take a little time to have you good New England spinners adopt this process, but it is here and has come to stay, and you must lead; for our English cousins never change unless forced to do so by example or injurious competition. This cotton is intrinsically worth to the spinner, from 3-8 to 1-2 a cent a pound more than the old flat compressed cotton. A strong recommendation of this process is its perfect protection from moisture and fire. If stored

in a dry and well-protected vault, I can imagine nothing that would keep for a longer period than one of these cylindrical bales, pressed with all the air driven from it by rollers. And if we could live long enough to test it, I believe an Egyptian mummy would be but a baby by the side of it. The government reports have given, and I have no doubt but what you have all read the accounts of how cotton is ginned and compressed in other countries, so I will not detain you with quotations from them. Suffice it to say that in Egypt it is stated that the enormous pressure of 2,000 pounds to the square inch is used, and in our compresses now used, 18 to 24,000 pounds on each bale, while the hardest pressure required in a cotton ginner's compress to produce a bale of cotton with a density of 35 pounds to the cubic foot, is 200 pounds to the square inch; so there can be no question raised about the fibre being damaged. Really, this process straightens out the fibre, and places it in better condition for the cotton mills.

One of the strongest objections raised has been the sampling. It was claimed that we could not sample it. I am glad to state that we have now a blind but honest sampler; an automatic machine, that with but a little cost and absolutely correct, samples every bale of cotton as it is being pressed. It takes from it three samples, one when the bat has first commenced to roll on mandrel, one when the bale is half made, and one just before it is completed, and a guarantee to the manufacturer is given for twelve months, that it is full up to the samples as abstracted, which goes with each bale. So, instead of its being hard to sample, this now is its strongest endorsement, as it is positively the only bale of cotton that has ever been sampled correctly and guaranteed by the parties who always should have made good any defects — the producer. It is not a hardship upon them, for it is only in line with every other custom of commerce. The producers of everything in merchandise is guaranteed by him, and in this instance he has no risk to run; for if he gives the sample drawn by this automatic machine, ***he, the middleman***, and the consumer are all alike protected, and it is therefore a common benefit and protection.

Under this revolution we obviate the use of bagging and ties save one handling on the farm, home baling. We decrease freights one-third, insurance one-half, storage one-fourth. We put the raw material in the most perfect condition for transportation and protection that has ever been since the discovery of cotton.

The PRESIDENT. We have all had the pleasure of weekly interviews with the next speaker through the medium of his paper, *The Baltimore Manufacturers' Record*, but it gives me especial pleasure to present him personally, as I know of no one in the South better fitted to speak on the topic he has chosen, "Growth and Advantages of Cotton Manufacturing in the South," Richard H. Edmonds, of Baltimore.

COTTON MANUFACTURING INTERESTS OF THE SOUTH.

MR. RICHARD H. EDMONDS, BALTIMORE, MD.

As the South built its first cotton mill about the same year in which SAMUEL SLATER laid the foundation of New England's textile industry, it may be of interest to briefly look into the reasons why the former section until recently failed to develop its cotton manufactures except to a limited extent, while the latter was making such great progress. This is essential to a right understanding of the conditions prevailing at present in the two sections and will provide an answer to the oft-repeated question — If the South has the great advantages for cotton manufacturing claimed for it, why has it not fully developed this industry before this? The spinning and weaving of cotton for domestic use, or as it was called in olden times, the making of "homespun" goods, was almost universal throughout the South. It is related of JEFFERSON, that in his own household he "employed two spinning jennies, a carding machine and a loom with flying shuttle, by which he made more than two

thousand yards of cloth, which his family and servants required yearly." "The four southernmost States," said Mr. JEFFERSON, in a letter written in 1786, four years before SLATER built a small mill in Pawtucket for Messrs. ALMY & BROWN of Providence, "make a great deal of cotton. Their poor are almost entirely clothed in it in winter and summer. In winter they wear shirts of it, and outer clothing of cotton and wool mixed. In summer their shirts are linen, but the outer clothing cotton. The dress of the women is almost entirely of cotton, manufactured by themselves, except the richer class, and even many of these wear a great deal of homespun cotton. It is as well manufactured as the calicoes of Europe." This domestic manufacture was very general throughout the South. The cotton for the spinning process was prepared in general by the farm laborers, who picked the seed from the lint by hand. In 1790 a mill, run by water power, was established in South Carolina, which the records say had "ginning, carding and other machines, also spinning machines with 84 spindles each." The history of colonial times and of the first few years after the Revolution, show that the natural tendency of the people of the South was far more largely than is usually supposed, towards industrial pursuits. WASHINGTON'S father was a miner and a shipper of iron ore and was interested in an iron-making furnace. JEFFERSON carried on quite a business in domestic manufacture of iron, and his slaves, so the records show, "made about a ton of nails a month at a considerable profit." In South Carolina iron making was being carried on in 1773, and a few years before that the State offered liberal premiums to those who would establish iron works, giving to this industry the same encouragement that Massachusetts granted in 1787 to aid a cotton mill started at Beverly, to the promotion of which the Legislature voted £500. All history shows that in those early days the South was as much interested in the extension of its industrial interests as was New England. But when WHITNEY invented the gin, making possible the extension of cotton cultivation to

meet the consumptive demands which had been created by the inventions of ARKWRIGHT, HARGREAVES, and others, he opened a field for the employment of capital and labor more profitable than manufacturing. As capital, brains and muscle always turn to the employment yielding the largest financial results, the whole trend of southern thought was drawn to cotton production, with rice, sugar and tobacco coming in only a little behind. In 1801 the average New York price for cotton for the year was 44 cents, and for forty years, from 1800 to 1839, the New York prices ranged from that figure to 13 cents, and for the whole period averaged over 17 cents a pound. With such profits as these prices yielded, it would have been contrary to all economic history if the South had failed to concentrate all its energy upon the extension of cotton production. It could not be expected that men should fail to grasp such money-making opportunities as cotton-growing presented for at least two generations, or from 1800 to 1860, with the single exception of the decade from 1840 to 1850, during which period over-production and other causes forced prices to the lowest ten-year average on record. It is interesting to follow the marked turn which this decline in profits on cotton gave to industrial pursuits, awakening into new life the long dormant industrial capabilities of the people of the South. This is illustrated by a few facts from census reports. In 1850 the South had 2,335 miles of railroad, and the New England and Middle States 4,798 miles; by 1860 the South had increased its mileage to 9,897, quadrupling that of 1850, while the New England and Middle States had increased to 9,510, or a gain of only about 100 per cent. In 1850 the mileage of the two northern sections exceeded that of the South by 2,463 miles. By 1860 the conditions were reversed, and the South led by 387 miles. In that decade the South spent $220,000,000 upon the extension of its railroad system, nearly all of it having been local capital. During this period the South doubled its capital and output of flour, sawed and planed lumber, iron founding, steam engine building, etc., and in 1860 had $12,000,-

000 invested in cotton mills. Nearly all of its factories of all kinds were moderate in size, but in number they aggregated 24,590, and their capital was $175,100,000. But this a digression.

The wonderful prosperity which cotton production brought about finds an apt illustration in the simple statement that though the South had only one-third of the country's popula- and only one-fourth of its white population, the assessed value of its property, according to the census of 1860, was $5,200,000,000 out of a total of $12,000,000,000 for the entire country or 44 per cent. But when the war ended the two sections had been widely separated. Relatively, one swept by destruction, had been thrown back in its career half a century, while the other had been marvellously stimulated and pushed forward half a century as compared with the positions of the two sections in 1860, thus creating a great gulf of a hundred years between them. The New England man who seeks to understand the South must look at it in this light. He must see that it is not simply a case where one section stood still for a quarter of a century as a result of the most disastrous war in the world's history, judged financially, and by its immediate effect, and the other section advanced by leaps and bounds. The property, the ambitions, the hopes, the labor system of a whole section were swept away and in the destruction went hundreds of thousands of its ablest and most energetic men. It is only that this section may be studied in the light of these facts that they are mentioned. What this section has accomplished has been worked out under these disadvantages, and understanding this it is possible to better understand and appreciate the future of the cotton manufacturing interests of a region whose mills are already consuming 1,000,000 bales a year against 2,000,000 bales for the remainder of the country. Our New England friends can in this light more clearly study the forces now at work for southern upbuilding and decide whether to join their southern competitors on their own ground and secure the same advantages which they enjoy or disregard their competi-

tion. Personally, I am firmly persuaded that New England will find it profitable to take an active part in the development of the South's cotton mill interests and thus reap some of the profits. This section offers to New England the same opportunity which the world has afforded to Great Britain — a field for the employment of its surplus capital and energy to the profit of all parties interested. I have been informed by one of the leading cotton manufacturers of New England that at least 300,000 new spindles must annually be added to the mills of that section to offset the depreciation from wear and tear. This has not been done, I believe, in recent years.

At the present time the South is building about 100 new mills, which, with enlargements now being made to existing plants, will need for equipment over 800,000 spindles. At the risk of wearying you with statistics, it becomes necessary to present some figures to show the actual progress which the South has made in this industry. The census of 1880 reported that there were in the South 180 cotton mills with an aggregate capital amounting to $21,976,000, and having 667,000 spindles. By 1890 this had nearly trebled, and we had 254 mills, $61,-124,000 of capital and 1,712,000 spindles. No one would have dared in 1890 though to predict that the figures of that year would treble in another decade, but this we can now see will be done. Five years have passed, and the South has in mills now in operation and those which will be at work within sixty days, 3,000,000 spindles. Add to this number 800,000 for mills under construction, and by the end of the current crop year this section will have 3,800,000 spindles in operation. It will then only require an average increase of 300,000 spindles a year to give the South a total of 5,000,000 spindles by 1900. It is now safe to predict a considerably larger number than that.

The relative growth of the consumption of cotton in northern and southern mills of late years, as reported by the New Orleans Cotton Exchange, has been as follows:

Crop Years.	Northern Mills. Bales.	Southern Mills. Bales.
1894-95	2,083,839	862,838
1893-94	1,601,173	718,515
1892-93	1,687,286	743,348
1891-92	2,190,766	686,080
1890-91	2,027,362	604,661
1889-90	1,799,258	546,894
1888-89	1,785,979	479,781
1887-78	1,804,993	456,090
1886-87	1,710,080	401,452

Under the activity prevailing last year in cotton manufacturing interests northern mills regained most of the loss of the two preceding years, but their purchases were still 107,000 bales less than 1891-92, while during the same period southern mills increased their consumption 176,800 bales compared with 1891-92. The *Commercial and Financial Chronicle* distinguishes between the "takings" or purchases and the actual consumption, and makes the figures as follows:

ACTUAL CONSUMPTION.

Crop Years.	Northern Mills.	Southern Mills.
1889-90	1,800,000	549,478
1890-91	1,925,000	605,916
1891-92	2,025,000	681,471
1892-93	1,950,000	733,701
1893-94	1,675,000	723,329
1894-95	1,840,769	853,352

According to these figures the actual consumption in northern mills, while larger, of course, than during the panic year 1893-94, was less than for any year since 1890-91, having been 85,000 bales smaller than in the latter year, and 185,000 bales smaller than in 1891-92. Southern mills, on the contrary, gained nearly 250,000 bales compared with 1890-91, and 172,000 bales compared with 1891-92. In 1890-91 the South consumed less than one-third as much cotton as northern mills; last year southern consumption was nearly one-half as much as northern,

and is steadily gaining. For the present year it will be at least 1,000,000 bales, which is more than half as much as northern mills will consume.

Of the advantages of the South for this industry, it is almost needless to speak. Probably the most important consideration in the estimation of mill men is the labor. The South has an abundant supply of the very best help from which to secure mill operatives. An investigation on this point will convince the most skeptical. A New England mill owner lately stated that, to say that New England mill help was in any way superior to Southern was simply to say that the lower classes of foreigners are superior to the native Anglo-Saxon Americans. Half a century ago New England mills were operated by native Americans — daughters of the small farmers in the neighborhood of the mills; but the incoming of French Canadians and others drove the American girls out of the mills. There is no danger of this in the South, at least for many years to come. The supply of possible operatives, eager for the opportunity to earn a living by working in cotton mills, is to-day sufficient to equip three or four times as many mills as we have, provided these mills are not clustered too closely in any one locality. The increase in the help supply will be almost as great as the increase in mills for many years. These people are capable of acquiring the highest skill required in cotton manufacturing; they are docile, not given to strikes, and as a class are anxious to find work and willing to accept much lower wages than northern operatives are compelled to have in order to live. On this point it must be remembered that nature has made it possible to live in the South at a very much lower cost than in the North, because of the lower cost of fuel and clothes, the cheapness with which food can be produced, and the abundance and cheapness of building materials. These are permanent advantages: no possible change of conditions can alter them. They forever guarantee a lower labor cost in the South than elsewhere. What it means to have the cotton mills in the cotton fields, with cheap

and abundant fuel and water power, the ability to secure as sites for mills at a nominal cost a large tract of land on which to establish a mill community entirely under the control of the mill management, you can appreciate.

In order, however, to fully understand the South's strong position as a cotton manufacturing area, it is necessary to take a comprehensive view of the general trend of the world's business. Everywhere manufacturing is tending to the source of raw material, provided the facilities for production can be secured. In former years the profits in manufacturing were sufficiently large to justify the transportation of raw material. New England could haul its cotton a thousand miles, and its coal almost an equal distance, and find a profitable market for the production of its goods. Great Britain could import its cotton from America, operate its 40,000,000 spindles and market the product of its mills throughout the world. But with the decreasing margin of profit in manufacturing, it is in cotton, as in iron, timber and other lines of industry, necessary for the mill to seek the source of supply. In the fullness of time the South's opportunity has come. Its own people have demonstrated their unusual ability in cotton manufacturing. The profits in this industry throughout the South have been sufficiently great to turn the attention of this entire section very largely to this industry. The ablest financiers in the South, the most conservative bankers, the general merchants and the farmers are all now investing freely in cotton mills. The 3,000,000 spindles which the South now has in operation is scarcely 4 per cent. of the number of spindles in the world — latest reports giving the total as 85,000,000, although the South produces over 60 per cent. of the world's cotton crop. There are abundant reasons, easily understood by any man who will take the time to investigate, why the South was unable after the disastrous losses of the war to take up industrial pursuits until about 1880. It is mainly during the last five or six years that the greatest progress has been made, and every year is adding

increased momentum to this movement. Looking to Central and South America and to Asia and Japan, by the cutting of Nicaragua Canal, for a market for American cotton goods, the South's position is impregnable. It has every possible advantage that can be asked for the production of cotton goods at the lowest possible cost. Its advantages for distribution are but little inferior to those of the North, and whatever disadvantages it has in this way will be eliminated under the general progress which is being made. No one can possibly any longer question the South's future position in the cotton-manufacturing world. The rapid development of the textile industry in the South does not necessarily involve its decrease in New England or Great Britain. Even should these hold their present business and continue to operate as many spindles as they do to-day, the natural increase which the ever-growing demands of the world require must be met by the South. It is possible that China and Japan may become factors in this industry, but if they do the reduced cost at which they will produce goods will simply be an additional force to drive the capital in New England and British mills to the South as the only place which can hope to meet competition from mills in Japan and China, provided this industry should develop largely in those countries.

The South's position is safe. It is only a question as to whether the mill owners of other sections shall leave the South to develop this industry with its own capital and by its own labor, or join in the work and thus secure a part of the profits and all sections be mutually benefitted by an interchange of investments.

Session adjourns to meet at Council Chamber in Chamber of Commerce Building, corner of Pryor and Hunter streets, October 25th, at 2.15 P. M.

AFTERNOON SESSION.

2.15 P. M., OCTOBER 25, 1895.

Council Chamber, Chamber of Commerce Building. Meeting called to order. President GOODALE in the chair.

The PRESIDENT. The first topic on the list for this afternoon is "Cotton Mill Building in the South," by Mr. W. D. SMITH WHALEY, of Columbia, S. C., and I take great pleasure in introducing Mr. WHALEY to you.

[On account of the illness of Mr. W. D. SMITH WHALEY, who desired to make some additions to his contribution, this paper is necessarily deferred to the next volume of the "Transactions."—*Secretary.*]

The PRESIDENT. The next paper on the list, in the absence of the author, will be read by the Secretary, "The Unmerchantable Method of Baling American Cotton," by STEPHEN M. WELD of Boston, Mass.

THE UNMERCHANTABLE METHOD OF BALING AMERICAN COTTON.

Gen. STEPHEN M. WELD, Boston, Mass.

In response to your request for a few lines from one who is a buyer of cotton, as to the disadvantage of the present form of cotton bale, I would respectfully submit the following.

Cotton, owing to its inflammable nature, its liability to lose or gain largely in weight from exposure to heat or moisture, and the certainty to serious damage to staple by exposure to weather, should certainly require the greatest care, not only in its preparation for shipment before it leaves the compresses or warehouses, but also during the period of transit while in the custody of railroads and steamship companies. What are the facts in these respects? In my opinion, cotton is one of the most abused articles of merchandise which is marketed in the country, from the time it leaves the plantation, and even before, until the hour it reaches its final destination, the warehouse of the consumer. Insecurely wrapped in the loosest of bagging at the outset, the American cotton bale is poorly fitted to withstand the rough usage which it inevitably receives, owing to its great bulk and weight. The bagging is torn to shreds by the hooks of the freight handlers, and cut by samplers, so that the bale is in a condition to distribute a portion of its contents through every State in the Union, from Texas to Maine. As though this were not enough, during the early shipping season, the ports and interior points become overcrowded, and thousands of bales are stacked in the open air, with no protection

whatsoever from the elements. Of course this is to a certain extent unavoidable, during the season of the heaviest receipts, but I wish to emphasize the desirability of a better method of preparing the cotton for the treatment it is about to receive, and I think a fortune is in store for the man who can devise some closely woven, durable material, which will be partially if not wholly water-proof, and at the same time cheap enough to make it an object to planters and others to use it. I think it can, and sometime will be done. Another disadvantage under the present system is that it is almost an impossibility to mark a bale of cotton distinctly and indelibly. Various methods have been tried to accomplish this object. During one season, some years ago, we stencilled the bands, but soon found that it afforded insufficient surfaces for a legible mark, and moreover was liable to be broken off entirely, and the idea was abandoned. The bagging being coarse and open, the marks, no matter how large, soon become very indistinct, besides which it has to be cut for the purpose of sampling, which causes the obliteration of the mark altogether, in many cases. These sample holes are generally left uncovered, the bagging is torn to shreds by frequent handling, and the cotton is then left to the mercies of a cold world, and the losses from stealing and falling out, must be considerable. Should this loss, in addition to the natural shrinkage by moisture, exceed five pounds per bale, a claim follows, and the shipper has to suffer.

The difficulty of tracing lost bales, which arises from the obliteration of the mark is something which entails enormous expense to every cotton buyer in the United States, as well as all the transportation companies. The firm with which I am connected, have yearly an enormous correspondence on the question of missing bales, arising wholly from the obliteration of the marks. A claim covering say one lost bale, will frequently lead to months of correspondence, and often ends in litigation. The mass of papers which accumulates with each one of these claims is very large. Often a package of fifty to a hundred letters

tacked together reaches us at the end of the correspondence on some one claim. Nine-tenths of this work would be done away with if the bale could be marked so that it would not be easily obliterated. With the present coarse, flimsy covering, such marking is impossible.

The round form of the bale lately produced by the so-called Bessonnette process of compressing, obviates some of the difficulties I have spoken of. In my opinion, however, the effect of this process will be to compel the compresses and gins at the South to use a better, lighter and closer style of bagging, and more hoops, the tare on which will not be as large as on that now used. Egyptian and East India cottons are shipped in this way, and are almost invariably received in good order, while the loss in weight is very small. The tare is also less; the Egyptian bale averaging 750 pounds against the American 500 pounds, with a tare of not over 23 pounds. I hope that the Bessonnette process will compel this improvement. I understand that Egyptian and East India cottons are handled differently from American. There, as a rule, cotton is bought, shipped to a warehouse and baled by each shipper, thus avoiding the necessity of sampling, until it reaches point of destination.

The objection to the Bessonnette process is the difficulty of sampling, and the question whether the process can be run rapidly enough to compete with the ordinary compress. In the effort to obtain speed, in some of the new methods of compressing from the gin, but not we believe in the Bessonnette process, the staple has been greatly injured. Whether this has been now remedied or not I do not know.

I am of the opinion that it would be a saving to the mill to offer an inducement to the shipper to use extra care in baling, for there would be an actual saving of the cotton now lost in transit, and any frauds in the weights would be more easily detected. There would be less liability of its going astray, avoiding long and tedious correspondence, and perhaps litigation with transportation companies.

Improvements in the preparation for market have been made in most other products within a few years. Patent freight cars have been invented and successfully used for the transportation of many articles of consumption, notably the refrigerator car for the shipment of beef, etc.; but so far as I know, with the exception of the use of more powerful compresses, there has been no progress made, and no change of importance, in the method of baling and shipping cotton. Is this because you consumers have not demanded it, or is it because the present method reached perfection years ago? I leave you to answer this question, with the hope that if the foregoing remarks are not entirely practical, they may serve to provoke a thoughtful consideration of the subject.

The PRESIDENT. The next question is "The Cultivation, Picking, Baling and Manufacturing of Cotton from a Southern Standpoint," by Mr. D. A. TOMPKINS, of Charlotte, N. C. It is unnecessary for me to introduce Mr. TOMPKINS. When we stopped over there you all met him, and I am sure that he will treat the subject in same manner in which he treated us there.

THE CULTIVATION, PICKING, BALING AND MANUFACTURING OF COTTON, FROM A SOUTHERN STANDPOINT.

Mr. D. A. Tompkins, Charlotte, N. C.

From time immemorial the praises of the olive tree have been sung. The oil and the fruit it has furnished have been regarded to be of inestimable value. Yet throughout the ages in which the olive leaf has been made into the crown of honor or the emblem of peace, because of what the olive tree yielded for the benefit of mankind, the cotton plant has lived, but its amazing value has remained to be known in this century.

Food, clothing and shelter; these are the prime needs of mankind. We have now from the cotton plant the following:

1. *For Food.*—Cotton seed oil which, when pure and well refined, is in all respects equal to olive oil, and when it contains ten per cent. of olive oil simply to give it a flavor, cannot be distinguished from olive oil even by experts.

Cotton seed meal as food for cattle, sheep, and many other animals; in this way it contributes to our supply of beef, mutton, milk, butter, wool, etc., etc.

2. *For Clothing.*—The infinite fabrics that are made of cotton for human clothing, domestic articles, wadding for clothes, quilts, etc., etc.

3. *For Shelter.*—Tents, decks of ships, roofs of houses, etc., etc.

In fact, the cotton plant furnishes more of the necessities of the human race than comes from any other one source.

The development of the production of cotton in the United States within a single century from insignificant proportions to 10,000,000 bales a year, considered in all its relations to our industrial progress, is without a parallel in history. First of all, it is a sufficient answer to the charge against the southern part of the United States that the people are without enterprise or mechanical ingenuity. It may be answered, "The South alone is adapted to the production of cotton; if it would only grow in the North, a different showing might have been made by that section." But cotton grows in India, in Egypt, in China, and in South America, and a people cannot be without enterprise who, in competition with such a wide-spread cotton area — in many parts of which the plant has been cultivated for centuries upon centuries — in less than one hundred years are able to show a production far exceeding that of all the rest of the world.

In 1820 the cotton crop of the United States amounted to about 600,000 bales; in 1894 the yield reached nearly 10,000,000 bales. During the greater part of the interval the price has been about ten to twelve cents per pound, but it has been as low as five cents, and as high as twenty-seven cents, leaving out of account the years of the war (1860 to 1864), when the South practically stopped producing cotton. Estimating 500 pounds to the bale, and the price at ten cents per pound, the crop of 1820 would have been worth, in round numbers, $24,000,000. On the same basis the crop of 1894 would have a value of $500,000,000. This great increase in production has been made in a section in which there has been no such constant tide of immigration as has been experienced by other parts of the United States, and for this reason alone the result reflects great credit upon the people who have accomplished it.

This great achievement is the result of three things combined, namely: (1) the enterprise and energy of the people; (2) the invention of the cotton gin; and (3) the designing of buildings and mechanical appliances by which the gin could be economically operated.

It appears to be commonly believed that the successful production of large cotton crops in the United States is due to the invention of the gin alone. While this has been an essential element in the problem, yet Egypt, India and South America, which have the advantage of perfected apparatus, due to inventions made in America, produce cotton neither so cheaply nor in such quantities as in the United States.

I am far from wishing to take from Mr. ELI WHITNEY any of the credit that attaches to his name for the invention of the cotton-gin. He stands, in my estimation, at the head of the list of all those whose inventions have been a benefit to mankind. In the invention of the cotton-gin there is glory enough to immortalize WHITNEY'S name, with plenty to spare for the credit of others who did valuable and essential work in the development of what he produced.

When Mr. WHITNEY first visited Savannah, much had already been accomplished in the way of creating conditions for the more economical production of cotton. A commission had been appointed by the State of Georgia, charged with the duty of causing a machine to be devised for the separation of the lint of the cotton from the seed. Mr. JOSIAH WATKINS had in opertion a crude machine, similar in many respects to the more nearly perfect gin which WHITNEY constructed. The substitution of the saw for wire spikes seems to have been first made by Col. O. A. BULL, of La Grange, Georgia, and a little later, but independently, by HOGDEN HOLMES, of Fairfield County, South Carolina, and it was this improvement, more than any other one thing, that put the cotton-gin in shape to become such an important factor in the development of the cotton interest.

While the times were ripe for the invention of the cotton-gin, and many persons were working at the problem, and while the gin would probably have been invented even had WHITNEY never come to the South, he was just the right man to quickly take up the suggestion of the Georgia State commission. He saw the Watkins machine, worked on the problem himself,

heard of HOLMES' improvement and went to see it, and to his own ideas and work he added the best of what he gathered from various other workers on the same problem. The result was the Whitney gin.

Fig. 1 shows a cross section of a Whitney gin as built in the present time.

A is a hopper into which the cotton is put.

B is a carrier, slatted belt by which the cotton is moved gradually towards the feed roller C.

C is a feed roller, having spikes which carry the cotton over into the "breast" of the gin.

D is the gin breast, in which the seed cotton forms into a roll.

E shows one of the ribs.

F is a shaft on which the gin saws are fastened. These gin saws are blocked apart about half an inch and each saw passes through a space left betwixt two ribs.

Gins are commonly made to have 60, 70 or 80 saws.

G is a shaft carrying a cylindrical brush. This shaft revolves about three times as fast as the saw's shaft and in the opposite direction. It is so arranged that this brush clears the saw teeth of cotton. The draft of air created by the rapidly revolving brush also blows the cotton to the condenser.

H is a skeleton cylinder clothed with woven wire. The air goes through this. The wire cloth catches the cotton. The cylinder revolves and a bat is made which is discharged on to the floor from which place it is taken by an operator to a press.

A seventy saw gin will gin about one bale per hour.

Before the late Civil War neither the feeder nor the condenser was used. In those days cotton was fed into the gin by hand by negroes. The lint was blown by the brush into a lint room and was gathered by hand and carried to the "screw," as the press was called, in baskets.

A machine having been invented that would separate the lint from the seed, there was at once a need for a proper house in which to operate it, and some power to drive it. Mule-power

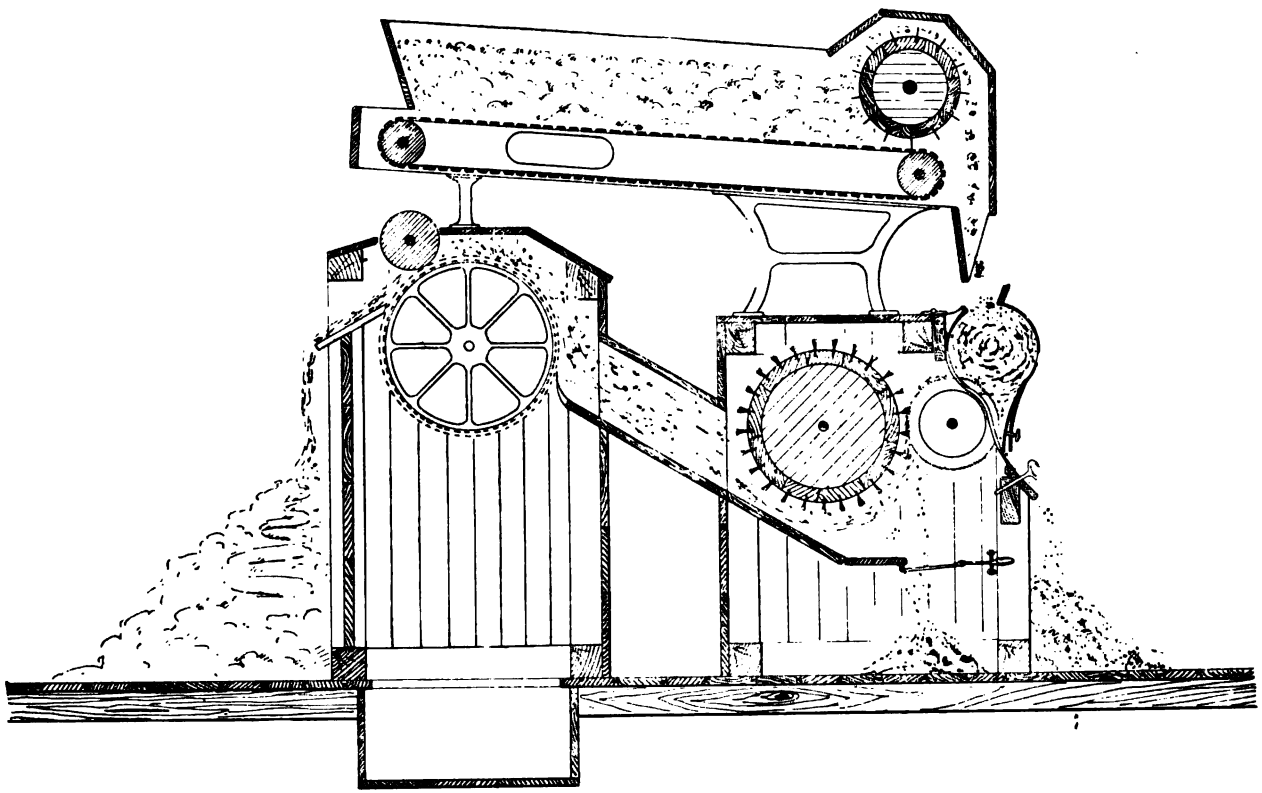


FIG. 1.—Cross Section of Modern Saw Gin, Folder, and Condenser.

FIG. 2.—Plantation Gin House and Screw.

was the most available, and wood was the most suitable material both for the building and the machinery for utilizing the power. Therefore a series of wooden wheels, gears and levers were devised by some one whose name is now lost. The house was built on posts in such a way that the machinery could be operated by mules under it. Considering the limited facilities at hand, this running gear for a gin-house for the utilization of mule-power exhibits marked mechanical ingenuity and adaptibility, the lack of which in other countries prevents such results in the production of cotton as have been attained here.

Fig. 2 represents a picture of an ante bellum gin-house and screw as they were operated in the days of slavery. The gin was operated by four mules by means of heavy wooden running gear underneath the gin-house.

The "screw" was made of a large wooden screw so put in a frame as that it could also be operated by mule-power and slave labor. The number of laborers required and the number of mules required were matters of little consequence, as ginning was generally done on rainy winter days at such times as it was difficult to find occupation for the negroes and the mules required to do the summer work of raising a crop.

When the gin, the gin-house with its appliances, and the baling-screw had all been developed to a condition of practical success, the production of cotton became at once very profitable. The desire to embark in the business made a demand for labor and increased the price of slaves. The slaves of the northern States were purchased, and still more were needed, which demand was partly filled by a trade with Africa itself; the ships of England and New England entered briskly into the business.

Slavery existed in England about one hundred years before it was tolerated in Georgia. Up to the time when the appliances just described gave such a stimulus to cotton-planting, general manufactures had prospered more in the South than in any other part of the Union. Even as late as 1810, according to the United States census for that year, the manufactured products

of Virginia, the Carólinas and Georgia, exceeded in variety and value those of all New England. While the production of cotton remained profitable, the growth of slavery stifled manufactures, and that interest steadily declined. Nor were any further improvements made in the appliances or methods for the preparation of cotton for the market. The standard ante bellum gin, gin-house and screw were practically the same in 1860 as in 1820. Many of those of 1860 were larger and finer than those built a quarter of a century earlier, but there was scarcely a new idea in design. The inheritor of slaves had become an aristocrat, and the cunning of his forefather in mechanical art had been lost. But while lost temporarily, it must have lived in the bones of the people, because no sooner had the late war ended, wiping slavery out of existence, than one improvement after another began rapidly to appear. Before the war mule-power, slave labor and wooden machinery were universally used for the preparation of cotton for the market. Every plantation had its gin and ginhouse, and, barring only the separation of the lint from the seed and packing, all operasions in handling cotton were performed by man-power. The cotton was packed by hand, carried into the gin-house in baskets by laborers, carried to the gin by laborers, fed to the gin by laborers, pushed into the lint rooms, carried to the screw, packed in the box of the screw and bound with ropes, all by hand. Slave labor was abundant, and cost so little that there was no incentive to improvement.

Subsequent to the war a feeder was invented for the gin, to save the labor of hand-feeding. Then came a condenser, to save labor in the lint room, then a hand-press that could be operated in the lint room of the gin-house, to save carrying the cotton to the screw, then a power-press, then cotton elevators, some using spiked belts and some the suction of air. Within thirty years the spirit of enterprise, invention and improvement in the people of the South has not only revived, but the entire method and all the machinery and appliances for preparing cotton for the market have been revolutionized.

FIG. 3.—A Modern Ginnery in Operation.

The cost of ginning 1,500 pounds of seed cotton and of baling the lint to-day is only about one-fifth of the cost in 1870. The plantation gin-house and screw have been supplanted almost entirely by the modern ginneries, which are centrally located and are manufacturing plants rather than plantation equipments. Many of them are incorporated as parts of plants in which the lint is separated from the seed and baled, the oil is taken from the seed, and the cake is ground into meal to be used as a fertilizer or cattle-feed, as the market may demand.

Fig. 3 shows a modern ginnery with its surroundings when in operation. These modern steam ginneries contain from three to ten gins.

Farmers bring the seed cotton in wagons and it is ginned for them in a few minutes. The farmers generally sell the seed to the ginnery. The cotton is taken away and sold in a market town.

In almost every community in the South there may now be found a manufacturing plant known as a gin, oil mill and fertilizer works. These gin cotton, crush cotton seed for cotton seed oil, and, having some of the ingredients which are used with cotton seed meal, mix commercial fertilizers. Out of this development has come the further business of fattening cattle on cotton seed hulls and cotton seed meal. Recently a large business has been developed by these factories in preparing a stock food made of cotton seed hulls and meal mixed. Befor the war the seeds were a waste product; ten years ago the hulls were used for fuel only. For the last few years cotton seed has been sold at $20 per ton, and the hulls at from $3 to $5 per ton.

The most expensive item now left in the production of cotton is the cost of picking the fibre from the stalks in the field. This opportunity for the exercise of ingenuity has not been neglected during the last few years. Numerous patents have been issued for cotton harvesters, many of which are absolutely without merit, but some of which are marvellously ingenious. One that seems, so far, to have come nearest to doing commercially suc-

cessful work is that of C. T. MASON, JR., of South Carolina. The extent of the incentive for the solution of this problem may be judged from the following estimate:

The price now paid for picking cotton is from 50 to 75 cents per hundred pounds. About 1,500 pounds of seed and cotton are required to make a bale of lint weighing 500 pounds. The cost of picking 1,500 pounds of cotton at, say 60 cents per hundred, would be $9. Therefore, to pick 10,000,000 bales, which limit it is assumed will be reached in the near future, would cost, at present prices, $90,000,000. It is claimed by the cotton harvester inventors that a machine can be made which with one mule and one laborer can pick or gather 4,000 pounds of seed cotton per day, whereas the picking of 150 to 200 pounds by hand is a good day's work.

Fig. 4 shows a cut of the Mason cotton picker. The two vertical cylinders revolve as the machine moves forward. The projecting fingers go around with the cylinder from which they project and also themselves revolve on their own axes, being actuated by a pinion and gear inside the main vertical cylinders. Imagine these small revolving fingers to be clothed with card clothing, and it can be seen how the cotton is engaged on them. By reversing their motion at a point as they go around the main cylinders the picked cotton is disengaged and carried by a conveyor to a bag. As a matter of fact the fingers are not clothed with card stuff but are punched in such a way as to leave teeth standing, this arrangement being thought by Mr. MASON to serve better than card clothing.

The following table will give some idea of the increase in production of cotton every tenth year and of the value of each crop included in the list, since 1820, expressed in round numbers. Values are all based on the rate of 10 cents per pound, and an average weight per bale of 500 pounds.

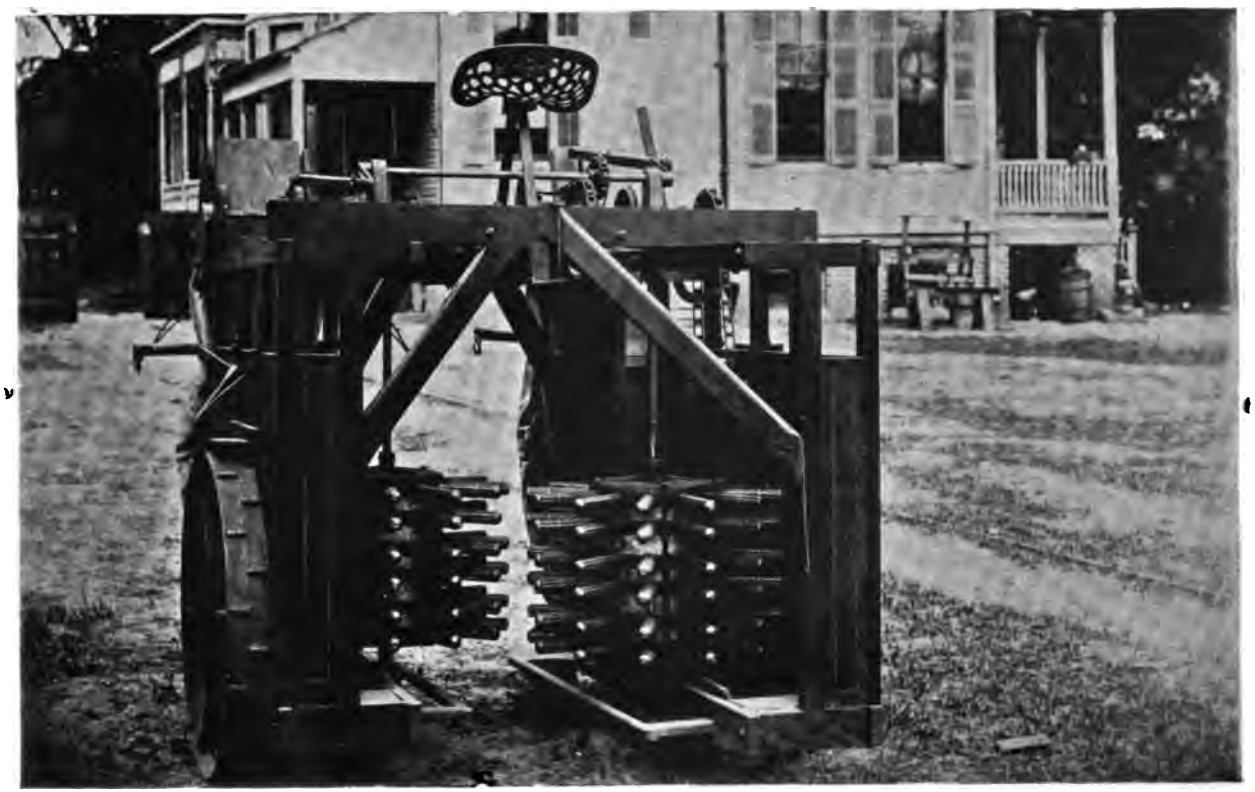


FIG. 4.—A Cotton Picking Machine.

Year.	Production in Bales.	Value at 10 cents per pound.
1820,	400,000	$25,000,000
1830,	1,000,000	50,000,000
1840,	1,600,000	80,000,000
1850,	2,250,000	112,500,000
1860,	3,600,000	180,000,000
1870,	4,250,000	212,500,000
1880,	6,600,000	330,000,000
1890,	8,000,000	400,000,000

As has been stated already, the seed was before the war a waste product, except where used in the southeast to a limited extent as a fertilizer. Since the war the cotton seed oil business has been developed to such an extent that in the current season (in which there will be less than usual) there will be about 1,500,000 tons of seed crushed for oil and other products. Out of these seeds come the following products, against which their values are shown:

50,000,000 gallons cotton oil	at $ .50,	$25,000,000
700,000 tons hulls,	" 4.00,	2,800,000
500,000 tons meal,	" 20.00,	10,000,000
50,000,000 pounds short lint	" .03,	1,500,000
		$39,300,000

This much comes out of what was in the days of slavery almost entirely wasted.

In the preparation of cotton for the market the subject of the bale or marketable package is receiving a great amount of attention at present.

A number of patents have been issued on machinery to make a compressed cylindrical bale. Many advantages are claimed for cylindrical bales and also, by the inventors, for the machines necessary to make them.

Fig. 5 shows one of the early Bessonnette machines as it was operated at Waco, Texas, when it first came out.

It is not alone in the utilization of cotton seed that the revived

mechanical genius of the South has been exhibited, but in the manufacture of the cotton into cloth and yarns as well. In a region of country reaching along the foothills of the mountains from Lynchburg, Virginia, to Atlanta, Georgia, almost every town has one or more cotton factories, built since the war. Many factories have been built on the water-powers in the country, and towns have grown up around them. At first only coarse goods were attempted, then finer and finer products by degrees. While as yet no very fine goods have been produced, enough has been done to prove that as capital accumulates and the owners acquire knowledge of the business and the operatives improve in skill, there is no more limit to the quality of goods that may be made in the South, than those that may be made about Lowell, Massachusetts, or Manchester, England.

The present industrial development in America, in England and on the Continent had its beginning in four events, the absence of any one of which would have destroyed the greater portion of the value of the other three. These were the invention of the power-spindle, the invention of the power-loom, the invention of the cotton-gin, and the response to these of the southern portion of the United States for the production of the raw material for the utilization of these inventions.

It is not alone of interest that the impetus given to the production of cotton by mechanical inventions has added to the productive capacity of southern agriculture and increased the wealth of an important section of the United States. Every family in the whole country has been benefitted by the cheapening of clothing and other articles made of cotton, by reason of the marvelous increase in the extent of production of this fibre. The manufacturing and commercial interests of New England have been promoted to a remarkable extent by the same cause, to say nothing of the effect upon the cotton manufacturing interests in England and other parts of the world, and the increase in the consumption of cotton goods due to the wonderful cheapening of their cost. The single item of the

FIG. 5.—The Bessonnette Roller Compress, March, 1893.

benefit to the shipping interests due to the cotton-carrying trade is of great extent. Cotton, more than any other one item of freight, has been the basis of transatlantic commerce.

It has been charged that the people of the South are careless of the manner of preparing cotton for the market. Within certain limits this charge is proper. In many respects it is not proper. The production of cotton in the South is one of the greatest of all agricultural achievements. The special lints, such as Ozer, Peterken, etc., might be put up as brands, and many other brands might be made and maintained. But the great bulk of cotton must be put up in cheap packages and put on the market at a cheap price.

Happily, for a man who knows about it, cotton is its own brand. It is easily examined and its qualities and characteristics are easily determined.

In the ante bellum days the combination of the white man, the black man and the mule created the production of cheap cotton for the great bulk of the world's supply. The combination still produces the greater part of the cotton supply that the world uses. In the future farming in the development of manufactures in the South it is quite impossible to foresay how this combination will stand.

As far as the development has gone the cotton oil business has fallen into the hands of white bosses and white labor. The businesses are owned in all cases by white people, barring the few exceptions which are only enough to prove the rule. In the matter of ownership the southern man has far greater concern about the competition of the New Englander than he has about the colored brother one way or another.

It is impossible for me to come to a conclusion as to whether the colored people would make successful mill hands or not. Nobody, not even those who know and love the colored people best, has ever had the courage to try the experiment. I believe I have about as many friends among colored people as any other average man, and yet I would not dare to try the experi-

ment of a cotton mill with colored operatives wlthout the full consent of all my associates or stockholders to lose money in the experiment, if it should turn out that way. Nothing but experiment can, in my judgment, ever determine the question. In order to determine it I would be willing to be one of 100 persons to subscribe $1,500 each for a mill to be operated by colored people until by losses it should be determined that the experiment was a failure, or by success it should be demonstrated to be practicable.

This experiment is important to the whole South. At the present rate of building mills we must soon reach the limit of the white labor supply in the South. If it is feasible to work the colored people in factories it means the solution of this labor question in the South for at least a quarter of a century to come, and perhaps a longer period. It means also great things for the colored people, because if they are not able to enter into the new industrial pursuits they may not be able to withstand Anglo-Saxon or free American competition. With white labor alone it will be only a few years before we reach the limit of supply. Then we will without doubt have the same laws, the same experiences and the same accessories of new labor from various sources that New England has had. The South will have even one greater difficulty. Your farms in New England are comparatively barren, and here in the South a family can make a more comfortable living on a cotton farm by one hundred days' work in a year, than can be done in New England in two hundred days' work per year.

The present cotton factory labor in the South is coming off the farms, it is true, but I am confident that to that sort of people who farm in the West cotton raising on farms in the South will be found to be very attractive and very profitable. The class of farming people who, in the South, are going into the mills are people who get along better under mill management than as independent farmers. There are still enough people remaining on farms in the South to raise 9,000,000 bales of cot-

FIG. 6.—Ante Bellum Cotton Producing Syndicate.
Planter, Negro, and Mule

ton per year, and the production of cotton is not going to cease to be attractive to people who like farm life.

As we get better school facilities we ought to and undoubtedly will further restrict the age at which children may be permitted to work in factories.

As the southern labor acquires better knowledge and skill in the production of goods the hours of labor will be restricted.

The general conditions will constantly approach closer and closer to those that have been already brought about in Old and New England.

But there will always remain with us here certain advantages which will not pass away, chief among which is the proximity of the cotton fields.

The events as they have transpired in the last thirty years would seem to warrant the following conclusions:

1. The production of cotton will be a constantly increasing quantity and as a general rule the price will be a decreasing quantity.

2. Increased production will in future be largely the result of the settlement of the lands by white immigrants.

3. The cheapening of the price will be the result of improved methods of farming and improved methods of preparing cotton for the market, and increased production.

4. That the interest of the white man, North and South, is now becoming identical, and in the face of this common interest no man can at this moment tell what will be the position of the colored man in the future development of this country. Education ought to improve his capabilities to hold his own in the increasing competition. Future experience alone can show where his abilities will place him.

Mr. A. H. LOWE. I would like to ask the cost of picking cotton?

Mr. D. A. TOMPKINS. At present the cost varies in different parts of the South and at different times from 50 cents to $1 per hundred pounds of seed cotton. This seed cotton is one-third lint and two-thirds seed. Taking a bale at 500 pounds it will be seen that the cost of picking cotton is 7.50 to $15 per bale. This is one and a half to three cents per pound. The value of a cotton picker that could do this work for, say $2 to $3 per bale, may be seen at once. It is a problem of finding how to apply horse-power or even man power to a work that is now done by the fingers only. The invention and development of the sewing machine is the successful working out of a similar problem. The successful cotton picking machine would probably be more profitable than the sewing machine or mower has been.

The cotton picking machine of which I show a picture is about as good one as any I have seen. None that I have seen are at all successful. Some of the alleged cotton pickers are made the basis for selling stock in cotton picker companies, the inventor having invented a method to make money easy rather than a machine to pick cotton.

Mr. A. H. LOWE. Did you say that it cost three cents per pound to pick cotton?

Mr. D. A. TOMPKINS. I said it cost from one and a half to three cents per pound. When cotton was sold at five cents per pound about one-half the price went for picking it. This is making no allowance for the cost of picking the seed which of course are in the cotton when it is picked. The seed was formerly a waste product, but are now worth seven to twelve dollars per ton.

The invention of a successful machine to pick cotton means larger crops and cheaper cotton. All the improvements have contributed to these two ends.

In many occupations the colored man equals or in some occu-

pations he may excel the white man. But as an independent farmer or tenant he is not, so far, the best sort of a success. Cotton lands in the southeast are much depreciated in value and this depreciation is apparently caused by a depreciation in the value of colored farm labor. It seems probable that the excellence of these lands and other favorable conditions must attract an element of thrifty white farmers from other sections of this country. If these lands should be subdivided, sold to white farmers who are as thrifty as those of the northwest, then by these farmers with the colored man as a most excellent helper, and by raising home supplies, it would be difficult to say just how cheaply cotton could be produced. There are many parts of Texas in which very much of the farming is done by white farmers and they are making money.

Mr. ARTHUR H. GULLIVER. I would like to ask whether colored labor has not been employed, to some extent, in southern mills — take the picking room for example?

Mr. D. A. TOMPKINS. I operate a mill in Charlotte, where the fireman is a colored man. In many mills a colored woman is employed to scour the floor. Dray drivers are generally colored people. Nobody should fall into the error of supposing that a southern man is not willing to employ the darkey wherever he can make money by doing so. Wherever a negro fireman is employed it is because it is more convenient or the work is as well or better done.

Mr. T. H. SMITH. Have you seen the cotton picking machines at the Exposition?

Mr. D. A. TOMPKINS. No, not at the Exposition. I think I have seen most that have been made and none that I have seen are successful. The chances are that whenever anybody succeeds in making an effective cotton picker, the result will attract general attention at once. A machine capable of earning so much money as a cotton picker could do, would soon be known about.

Mr. T. H. SMITH. They are working on this machine there

now just back of the main Exposition building. They have a plot of ground planted. Part of this plot has been picked and it looks as if they are going to make a success of it. They showed me the action of the spindle when at work. It is the most remarkable thing I ever saw. The fingers have a rotary motion and stand out in a way to pick the cotton when the machine goes forward.

Mr. D. A. TOMPKINS. Apparently the machine you speak of is the same one I illustrate.

Mr. T. H. SMITH. This one is made in Pittsburgh.

Mr. D. A. TOMPKINS. I have heard of that machine but never saw it. It is not the Mason machine. Out of all these experiments I think a successful machine will come sooner or later. Success is in my opinion more likely to come as a development rather than in the shape of one invention. The best baling method will probably also come as a development very much as the modern locomotive has been developed.

Mr. A. T. ATHERTON. I should like to ask what proportion of the seed does the farmer retain in order to renew his crop.

Mr. D. A. TOMPKINS. I should say about one-fifth. The amount varies with different methods of planting. Some farmers put in far more seed than is necessary and "chop out" the excess after it comes up. This is not altogether wasteful, as might be suppposed, because when the plant is destroyed the seed rots and becomes a very fine fertilizer for the plants that are left to grow. There are cotton planting machines so constructed as to put in very little more seed than is necessary for a stand.

Mr. A. T. ATHERTON. You stated that there was a certain proportion of the expense of picking returned in the seed; that is what I wanted to get at.

Mr. D. A. TOMPKINS. About one-fifth is regarded as necessary to replant. The seed from one bale of cotton would be half a ton which would be worth four to six dollars, according to market prices. Putting it at $5, it would be the equivalent

of about one cent per pound on the bale of 500 pounds. This amounts to, say one-half the average cost of picking.

Mr. A. T. ATHERTON. There is another matter that my friend, Mr. MARTIN, wanted me to speak about. He is willing to give his opinion as to colored help in a mill.

Mr. ALBERT G. MARTIN. I have worked colored help in the picker room and to some extent in the card room, and did it very successfully. I don't think I ever had better help as carders.

Mr. D. A. TOMPKINS. It is not a question whether colored people can be worked in a cotton mill. The question is, can a mill organized throughout (excepting bosses) with colored labor, other things being the same, make goods to compete with those from a mill organized with white labor?

Mr. J. H. KENDRICK. I would like to ask Mr. TOMPKINS a question in regard to the employment of colored help. I was told by a large manufacturer in South Carolina, about a year ago, that he believed colored help could be worked to advantage in a cotton mill and he would try it if allowed to, but his opinion was that the white population of South Carolina was not yet at that stage where they would allow a cotton mill to be built and operated by colored help. I would like to know Mr. TOMPKINS' opinion on this matter.

Mr. D. A. TOMPKINS. It would not be characteristic of the people of South Carolina to hesitate to employ colored people whenever they pleased. A colored man was foreman of construction for an oil mill built at Edgefield, S. C. Near this city is the Gate City Oil Mill where the refiner is a colored man. I have built many oil mills by contract and have always employed colored people in them by preference to white labor, because the colored labor seems to be peculiarly well adapted for oil mill work which is heavy and warm. I employed the labor most likely to give good results and get settlements on my contracts. They are employed as brick-layers, carpenters, blacksmiths, etc., etc., and in these occupations work side by side with white

people. These instances all apply to the male sex. White men and negro men work well together. I do not believe that white women would be willing to work on the same footing with negro women.

I am told that one of the difficulties of working colored people in a mill is that in the warm room and with very light work, they cannot be kept awake. Another is that in monotonous occupations they do not have the Anglo-Saxon patience or tenacity of purpose.

I have no doubt about their intelligence. There are certain things they do with more facility than a white man does. They are good at public speaking. I dare say the janitor of this building could make a better speech to you than I could. The weak spot, if there is one, is want of steadiness of purpose. I think they would learn quickly and do well for a short time. Whether they would continue to do well is the question. In talking to an intelligent colored man in Charlotte on this subject, he said he was sure his people would make good cotton mill hands if they were allowed to sing. He thought singing would keep them awake and in good cheer with the work.

In the production of cotton, in the oil mills, in the tobacco factories, colored people are freely employed. These are all occupations common to the South.

This business of manufacturing cotton came from you to us and it came with white operatives. The colored man is least employed in that industry in which most New England money is invested in the South.

Mr. JUSTIN A. WARE. In North Carolina I asked a colored man why he did not go into the cotton mill industry. The poor white trash worked in a cotton mill and the colored people didn't want to.

Mr. D. A. TOMPKINS. The cotton mill operatives of the South are almost entirely of good Anglo-Saxon blood. The experiment of putting negro help in competition with it has not been tried on any comprehensive plan and the colored man who

FIG. 7.—A Post Bellum. A Colored Farmer and his Wife.

was talking to you was simply doing a little vain boasting. The Anglo-Saxon laborer is in the meantime in possession of this industry, and it is yet to be proven whether the colored race can compete in it.

Mr. JUSTIN A. WARE. You made an allusion to the fact that cotton seed oil had been sent to Italy and returned to us in the form of first-class olive oil. I would like to ask if you have the facts at hand to show the extent to which that is done.

Mr. D. A. TOMPKINS. Speaking very approximately, I should say that cotton oil goes into trade about as follows: the lard makers in Chicago use about half a million barrels. Some three hundred thousand barrels are used yearly by the butter makers in Holland. Twenty thousand barrels go to the coast of Maine for packing sardines. About five hundred thousand barrels go yearly to the Mediterranean ports to be refined and put up as olive oil. It is used to make candles, soap, as an illuminating oil, as a lubricant in cutting thread on pipes and bolts, and for many other purposes. Your doctors in Boston prescribe it in cases of dyspepsia, it being used as a cooking oil in place of hogs' fat.

The PRESIDENT. The next paper is No. 12, "Some of the Disadvantages Experienced by the Manufacturer Through Poor Ginning and Baling of Cotton," by Mr. EDWARD W. THOMAS, Lowell, Mass.

SOME OF THE DISADVANTAGES EXPERIENCED BY THE MANUFACTURER THROUGH POOR GINNING AND BALING OF COTTON.

MR. EDWARD W. THOMAS, LOWELL, MASS.

At various meetings of this Association, papers have been prepared and read relating to the foregoing subject, with suggestions and hints as to what might be done in the shape of relief and improvements. We are still receiving poorly baled cotton, the subject apparently not having been brought to the attention of the planter or factor with such force as to preserve any lasting effect. It is not amiss at this point to call your attention to the fact that the manufacturer has suffered for years from the defects in baling cotton, and as long ago as 1877, it was the subject in connection with ginning cotton, of a paper prepared by Mr. EDWARD ATKINSON and read at one of the meetings of the Association, also by a committee report made to the Association in April, 1880, followed by the copy of a letter in the Transactions for October, 1880, by Mr. ATKINSON to F. C. MOREHEAD, then the president of the Mississippi Valley Cotton Planters' Association, in which the evils previously noted were dwelt upon. Later, in 1888, Mr. J. R. MAXWELL of Tuscaloosa, Ala., presented a paper on an improved method of baling. Again in October, 1892, the King process of baling was fully explained by Mr. D. M. THOMPSON, Providence, R. I., a member of this Association. Mr. THOMPSON'S experience as related in his paper has been my own so far as relating to a large

number of bales of cotton on fire at any one time. I desire in this paper to only treat of the poor baling of cotton, and try and show the many disadvantages we labor under from that matter alone.

The matter of proper baling is one of vital and grave importance to the consumer of cotton in the Northern States particularly, and it is proposed herein to briefly present the many disadvantages we labor under in using cotton as it is packed and baled at present. Is it because it has not been presented as forcibly or explicitly as it might or ought have been done that we are still the sufferers? Certainly no better opportunity has ever presented itself than at the present time, to have the subject carefully considered. Never before have the manufacturers been so ably represented as at these meetings of this Association in the heart of the South. The planter, factor and broker should all have this subject of baling brought so vividly before them that they will take some action in renovating the system. We, the manufacturers, are here to answer any questions that may be asked by them, and we are glad to have any opportunity. I think I but fairly and honestly represent the experiences which we all labor under. Cannot something be done to help the matter? Now is a good opportunity for concerted action.

To start with, in the matter of transportation too much care by the shipper cannot be taken in seeing that the cars in which cotton is shipped are clean and free from oil and contaminating substances, and thoroughly swept out. There are many evidences of bales having been put in cars in which the previous shipments were of oil, and the bales absorbing this from the floor and sides of car, when put in store houses often heat badly and take fire through spontaneous combustion.

COVERING.

To perhaps many who have not visited the large northern manufacturing centres where large amounts of cotton are used, but little conception can be had of the poor condition of the

covering of the bales as delivered to us by the railroads. One of the chief complaints in regard to the covering of the bales is that in many instances there is not sufficient care exercised at the compress or press in placing wrapper or sacking around the bales, and leaving no exposed portions of the cotton. We receive many bales where the sacking does not cover all the cotton, and additional hoops or ropes are put on to remedy the defect and to prevent the easy removal of the cotton. It is only necessary to add that all such exposed cotton when received is very dirty and in some cases unfit for use. We also find many bales wherein the sacking is used too freely, and the quantity is more than sufficient to properly cover the bale; this of course means just as much loss to the buyer. This latter item becomes quite a burden when we find many such bales in certain invoices.

The quality of covering is another exceedingly troublesome element. Much of the sacking has too open weave or mesh and means just so much more dirty and stained cotton in transit. The loss in staple clinging to the sacking when open woven is more in the closer woven. The stencilling of the invoice mark or weight upon the bale covered with such sacking penetrates into the cotton on this account. Many bales are not properly sewn on ends, and when they have arrived at destination are broken open and exposed. The sewing up of the openings cut through the covering in order to obtain samples of the cotton ought to be done, for these openings never grow less, and such openings only expose the cotton to the temptation of some one to purloin, and also to expose to the elements and outside influences.

UNIFORMITY IN SIZES AND WEIGHTS OF BALES.

One of the existing evils, if it may be termed such, is that of the great variation in the size of bales as received. We frequently find in some invoices bales varying in sizes from 18 to 26 cubic feet, and in weight from 300 to 650 pounds. There would seem to be no good or valid reason why cotton ought

not or could not be baled with the same care and systematic process that the buyers of cloth require the mills to put up the finished product. To give practical illustrations of the foregoing I present to your attention the weights of 10 bales from 10 different invoices taken at random, giving in the first column the average weight of the 100 bales; the next five columns the weights of the lightest bales, and the last five columns the weights of the heaviest bales.

TABLE SHOWING VARIATIONS IN WEIGHTS OF BALES OF COTTON. INVOICES ALL 100 BALES EACH.

From	Average Weights of Invoices.	Weights of 5 lightest bales.	Weights of 5 heaviest bales.
Texas	503.6	388-400-413-422-423	581-582-629-641-721
"	499.6	336-365-381-399-406	582-584-617-629-617
"	504.9	459-466-468-476-498	532-535-550-550-552
Alabama	485.98	300-351-380-388-403	558-576-578-585-680
"	521.78	403-453-468-488-493	588-608-615-643-683
Louisiana	497.20	343-360-392-410-412	577-590-623-642-670
Mississippi	503.83	378-403-415-428-428	608-608-613-618-663
"	487.14	353-358-378-389-402	595-608-610-611 611
Georgia	473.39	341-366-377-381-381	564-581-587-616-666
Texas	505.82	410-410-415-420-440	580-600-585-587-593

A glance at these figures will only tend to show a very large variation in weights, the lightest bale being 300 and the heaviest 721 pounds.

The cotton packed as thus represented requires from 15 to 20 per cent. more storage room than if packed in bales approximating at least some standard size. In a large warehouse known to the writer, during this present summer, containing 413,000 cubic feet of available storage room, only 12,500 bales could be placed. These were packed solid and as closely as possible. This gives about 33 cubic feet per bale, while the average size of the bales was somewhat less than 25 cubic feet each. Had the bales been of uniform size 2,000 more could undoubtedly have been placed in same storehouse. From many measurements taken by the writer the width and thickness of the bales

do not vary so much as the lengths, the general average of the former being 30 inches wide and 20 inches thick, while the lengths vary from 60 inches to 72 inches, and in this connection would state that had this same storehouse been filled with cotton put up by the Bassonette process, about 50 per cent. more weight could have been stored.

I do not doubt that my experience has been similar to that of the rest of you, and I am here to learn, if possible, why cotton is baled as it is, and I sincerely hope before these meetings close that our friends, the planter, the press, and the compress people, will favor us with their experience, their methods of baling, and why bales cannot be made of uniform size and practically same weight.

To many perhaps these matters delineated above may not seem to be at all serious, but it is the possible combination of them all that when aggregated make a large cost to the consumer.

In the matter of hoops perhaps not much can be said excepting at times we frequently find many bales with too many of them.

In using last year 26,150 bales of cotton, the average weight per bale of which was 504.30 pounds, the proportion of sacking on this was $2\frac{11}{100}$ per cent., and of hoops $1\frac{57}{100}$ per cent., making a total of $4\frac{28}{100}$ per cent.; this in pounds would amount to $21\frac{63}{100}$ pounds per bale or an aggregate actual *net* loss to the mills of over $36,000, this is 6 per cent. on an investment of $600,000 yearly. With the accumulation of sacking and hoops that in the market bring only about ¾ cents per pound for former and say 50 cents per 100 pounds for the latter, it may be readily seen that the loss to the mill is a serious one.

It was the writer's privilege not long since to have received some cotton put up by the Bassonette process, and with a view of carefully comparing with the regular baling, experiments were made to practically learn what advantage was in this system, and I beg leave to submit the following tests with the accompanying notes.

COMPARATIVE TESTS OF LOSS IN WORKING TEXAS COTTON BY REGULAR BALING AND BY THE BASSONETTE PROCESS:

	Bassonette Bales Lbs.	Regular Bales Lbs.
Total gross weight, 15 bales or rolls,	6995	8235
Average weight per bale or roll,	466.33	549
Average weight per bale of wrapper, hoops, etc.,	15.66	22.13
Dust and seed taken out on opener,	25	40
" " " " upright trunk,	26	25
" " " " breaker picker,	16½	22
" " " " intermediate picker,	35	38½
" " " " finisher picker,	15½	15½
Waste unaccounted for,	41	58
Wrought iron pipe centre rolls,	183	none
Weight sacking,	52	215
" hoops, ropes, etc.,	none	117
	394	531
Weight of laps from finisher picker,	6601	7704
Total,	6995	8235
Date of tests,	Oct. 27, 1894.	Oct. 31, 1894.

	Bassonette Bale.	Regular Bale.
Percentage laps to gross weight of bales,	94.37	93.55
" loss bale or roll to lap,	5.63	6.45
" " wrapper and pipe,	3.36	none
" " hoops, rope and sacking,	none	4.03
" " dirt and seed in opener,	.37	.50
" " " " dust trunk,	.38	.32
" " " " breaker picker,	.24	.28
" " " " intermediate picker,	.52	.49
" " " " finisher picker,	.23	.20
" " " " all operations,	1.64	1.78
" " unaccounted for,	.61	.73

The cotton in the fifteen (15) bales was strict middling from San Antonio, Texas. That in the rolls came from Waco, Texas.

All the foregoing cotton was run through the same set of opening and picking machinery consisting of a 40-inch opener with self-feed attached on lower floor of picker building; the cotton being delivered to the breaker picker in room above

through an inclosed dust trunk about sixteen (16) feet in length. The breaker, intermediate and finisher picker were each 40 inches wide, one beater each with evener attached to the intermediate and finisher machines.

In following the working of the cotton from these 15 rolls the laps were put through the regular machinery and processes in the mill and nothing unfavorable was noted.

The wrapping of the rolls, which consisted of light duck sewn on edge and ends, was quickly removed and the cotton underneath presented an unusually clean surface. The size of the rolls was 5 feet in length and about 24 inches in diameter, occupying a space, if stood on end and placed in building with centres in line each way, of 20 cubic feet, quite a material saving in space.

From the foregoing it would not seem amiss to emphasize the fact that more care ought be taken in wrapping and in delivering cotton to the consumer in far better shape than at present. Why with all the progressiveness of the American people, the system is allowed to exist is beyond our conception. It is safe to say that no other commodity with such value is packed or shipped with so little regard for contents. There is no more reason why cotton should be packed in such a way than that flour and pork should be put up in hundreds of sizes of barrels. And in closing, the writer has in the foregoing simply presented the facts as experienced by him, and would be pleased to learn why, if there is any reason or reasons, that the present system of baling should exist.

The PRESIDENT. The next one in order is No. 13, "The Relations of Employers to Employees," which will be read by Mr. HENRY E. WALMSLEY, of Newark, N. J.

THE RELATIONS OF EMPLOYERS AND EMPLOYEES IN OUR COTTON MILLS.

MR. HERBERT E. WALMSLEY, NEWARK, N. J.

The intelligent and skilful management of labor in our factories is without doubt of such supreme moment as to justify the bold assertion that this vital question far transcends in importance all other considerations, no matter how weighty, and should most certainly be regarded as such by all those of us who are called upon to guide and conduct successfully the great enterprises of which we here to-day are representatives.

This statement is made advisedly and with a full and thorough appreciation of the serious import of the one hundred and one different and difficult problems the management of our cotton mills are called upon to determine daily and even hourly.

It is with a profound appreciation of the delicacy of the subject that this question — this all-absorbing question of the relation between capital and labor—is now approached.

Sir HENRY JAMES, M.P., a former cabinet minister in the British government, when addressing the cotton factory operatives of Lancashire some three years ago, said, "As to the prospects of the future I will only say to you and those whom you represent in the operatives' interest, that you have only to ask and to have *under certain conditions*. You must ask what is moderate, you must ask what is just; you must ask what is required for the protection of your interests, without inflicting unnecessary injury upon capital. The time has passed for you to consider that employers are your enemies, there is necessity

for combination of purpose between employers and employed." The eminent man who uttered these words is a great friend of labor, and his wise remarks and sound advice might with equal force be addressed to the cotton factory operatives of the United States to-day. There is one thing very certain and that is, that we in this country — both employer and employed — should not follow the example of Lancashire, at least in so far as relates to strikes and lock-outs. We have seen so often in all parts of the world where disputes result in conflict and conflict in disaster — especially has this been so of recent years in the Lancashire cotton trade — note the Oldham lock-out of 1891–1893, which curtailed the consumption of cotton to the extent of some 500,000 bales — that it should surely be regarded on all hands as the first and foremost duty of everyone in authority to endeavor by every possible means to avert all such calamities. As so very much of the success or otherwise of the cotton industry of this country, both North and South, depends upon the harmonious and friendly relations of capital and labor, we cannot too fully and in all seriousness remember and realize that strikes and lock-outs are indeed a curse to all alike; great industries have been ruined by bad feeling between employer and employed, while on the other hand, as we all know, trade may be fostered and encouraged by a sound, healthy and contented feeling between master and man based upon a right understanding of the insuperable and inseparably connected interests of labor and capital. Whilst not claiming to advance anything especially new in these remarks, it is claimed in all earnestness that what is said will well bear repetition; the problem is one of sufficient importance to arrest the attention and arouse the most serious consideration of every one who may be called upon to grapple with this all-absorbing and momentous question. Strikes where at times they appear almost inevitable, may and often have been averted by a little mutual forbearance and by the exercise of reason and foresight; in other words by the mutual exercise of common sense. Any dispute that may arise

should be candidly and calmly considered, by which means a strike or lock-out with its attendant miseries and disasters may be avoided to the great advantage of the parties most interested and the community generally. The indispensable necessity of a clear and comprehensive knowledge of the matter under dispute is too obvious for remark. Justice in all our dealings, a belief in the existence of two sides to every question affecting the "help," and a resolution and determination to see fair play in all cases should be our watch-word when called upon to act in any and all disputes that may arise.

The operatives should on their part be prepared and determined to give a fair return of labor for a fair and reasonable wage. They should also not disregard those necessary rules of discipline and subordination without which no concern can be carried on with any degree of comfort, pleasure or profit. In this connection it would appear pertinent to likewise analyze the duties and grave responsibilities of the management, and it may here be truly and honestly admitted that not a few unfortunate and disastrous disputes may be traced to the mismanagement and want of foresight of the so-called and misnamed management. It has been truly said that "The greatest study of mankind is man," and how very true it is that to be successful in life — especially where one is called upon to control and lead others — one must know one's fellowmen. The vast interests involved in the business of cotton manufacturing are of so important and far-reaching a nature as to make it imperative that the leading positions in these establishments should be filled by none but the best qualified persons; by men of sound common sense, proved all-around ability and first-class character; men of executive ability and administrative capacity, and men who can manage the "help" and the entire concern with credit to themselves and to the satisfaction of their employers. System, order, method and discipline — without being too much of a martinet — are of the very greatest importance and very much may be gained by example supplementing precept, for this the opera-

tives are very quick in noting and unconsciously imitating with greater excellence all around.

The manager should constantly endeavor to create a mutual good feeling and good understanding with the work people, avoiding when ever possible being too severe, but at the same time upholding his legitimate and proper authority; whilst being easy of access and affable in manner, he should conduct and carry himself with the dignity and firmness his position and responsibilities call for. He should not on any account allow the operatives to be needlessly harassed or unnecessarily interfered with, so long as they attend to their work in a proper manner. He should show no favoritism but treat them as far as possible all alike, and according to their individual merits. Unless in exceptional and peculiar cases, tact, judgment and knowledge of the working man and his ways should suffice to secure harmony and good-will all around, for the work people as a whole have quite a fine sense of justice and equity. Ever maintain a strong and patient discipline, allowing every worker, from the highest to the lowest to be exactly what he is, neither more nor less. The manager should in every particular and detail be the manager, and so on down through the different positions; the higher one in command should never under any circumstances pass over or slight the next in command. The first attempt on the part of any one at undermining should be the last attempt. Every worker should satisfy his foreman, and understand that if he does not do so he cannot satisfy the superintendent, and so on up and down the scale. Every inferior officer should show due respect to his immediate superior in office, and any attempt on the part of a subordinate to go beyond or pass over his superior, should be dealt with as vigorously and relentlessly as the great Napoleon dealt with insubordination in his army. The manager or superintendent after having proved his leading men to be capable, reliable and honest, should trust them implicitly; there should be a mutual confidence and an assurance of being supported to the uttermost by those whom he supports to the utter-

most. Again turning to Lancashire, we find that many mischievous restrictions have been imposed upon the cotton industry there, which according to many thoughtful people — both operatives and masters—were not needed to guard the welfare or interests of the trade or those employed in it. Concessions to the demands of self-seeking professional agitators, injudicious and injurious to the best interests of both master and man, have been granted. The harassing and vexatious legislation of latter times is also held to-day by many in England to be responsible for so much of the trade which formerly belonged to England having taken root in other countries. Noisy and ignorant men who love agitation better than work, have got the ear and confidence of the operatives, stimulating them into making demands such as could not be conceded without serious detriment to the true interests of everyone truly interested.

No industrial legislation affecting the cotton industry of this country ought to be entered upon without the proposals in the first instance being submitted to both the employers and work people interested, and after agreement has been arrived at on each point, the bill as drafted should again be submitted to technical experts before it is introduced to the Legislature; otherwise legislation may go too far and so injure the interests of the employers in its desire to benefit the operatives, the only and natural result being disaster to both.

Some years ago Mr. EDWIN GUTHRIE, a recognized authority on the cotton industry of Lancashire, said that the ratio of increase in the growth of the cotton trade of England during the last decade had been greatly in favor of continental Europe, the United States of America and India, as against the ratio of increase in Great Britain, and that the cotton trade does not now flourish in Great Britain to the extent it does in other countries. He further said that Great Britain was falling behind in the proportion she is doing of the increased trade of the world. To-day some of the leading authorities over there say that to a large extent, owing to the shackled conditions of the industry and the

restriction of enterprise that has followed, the cotton trade is passing away from them to the continent of Europe; the United States of America, India, Japan and China; further that mills and weaving establishments have ceased to increase and that the number of unemployed is daily growing larger. Whilst we are loth to believe that a like condition of things will be allowed to take place in this country, nevertheless we may well take warning in time, and should not fail to profit by the deplorable spectacle presented to us in the unfortunate condition of affairs in the cotton districts of Lancashire, mainly brought about, we believe, through the ever recurring disputes between capital and labor. The cultivated intelligence which the spread of education amongst the masses of our people is producing, and the finer and quicker perception of our working classes, as against the duller and slower conceptions of the English operatives, is, we firmly believe, destined to play an important part in the intelligent and enlightened settlement of disputes between employer and employed in this country, and will, it may be predicted, go far towards saving us and our trade from similar disaster.

Both capital and labor have their duties and responsibilities equally with their rights and privileges, and unless this fundamental principle is conceded and lived up to in a fair and equitable spirit, there never can be an end to disputes and contentions. All efforts should be bent in fostering and encouraging a closer and more friendly relationship between employers and employed. Fully appreciating the value of trained and experienced help when guided and influenced by reason, we should cheerfully and gladly concede to labor its just rights, freely admitting its legitimate claim as an important factor in the premises. Where genuine grievances of employees do exist they should be redressed, but on the other hand harassing of employers cannot be tolerated, and the burdens and losses occasioned by bad trade must be shared equally and as far as possible cheerfully by both sides. Unfortunately in all communities

there are to be found mischief-mongers who arrogate to themselves the right to pose as the arbiters of their fellows, but who, in reality, are little if any better than socialists in disguise, instigating and prompting trouble and dissatisfaction; such persons have a mania for regulating everything for what they call the general welfare but which is only too frequently the most serious obstacle to the general good; they discard every particle of reason from their own conduct and refuse to listen to a particle of it from others. We refuse, however, to believe that the sensible and intelligent portion of the operatives of the cotton trade in this country will be deceived and misled in the manner in which the cotton factory operatives of England have been betrayed; rather do we believe and trust that they will resent this sacrifice of their true interests and retain possession of their control, co-operating honorably and honestly with their employers for the benefit of all. The operatives should be taught to regard capital as being in complete sympathy with labor, and therefore that they on their part should trust capital and not look upon it with suspicion and distrust.

We have faith in both the employers and the operatives of this country, that they will be guided in their future actions by all the surrounding circumstances pertaining to the industry and to the particular cases required to be dealt with from time to time. Neither party can afford to make demands and to carry them into practice which are not justified by reasonable evidence as being necessary and equitable between capital and labor. A faithful performance of what is undertaken to be performed, aiming at perfection and not being content unless we produce something in which we surpass others; a contented and satisfied body of operatives in harmony with their employers, and working with a will on the wonderfully perfect and self-acting machinery of to-day—the perfection and accuracy of which are indeed a marvel and a lasting and speaking monument to the enterprise, inventive genius and skill of our machine makers—will surely and most assuredly place us in the foremost ranks of

the manufacturing nations of the world, and will enable us to turn out any and every kind of cotton goods, equal in quality, fineness of finish and cost, to the best and most artistic work of the spindles and looms of either England or continental Europe.

The foregoing remarks have been called forth not for one moment in a spirit of dictation or presumption nor with any desire or intention of presuming to teach my peers how to manage their respective mills, the subject having been suggested as appropriate to the occasion by one of the most highly esteemed and leading men, occupying a prominent position and taking a most lively interest in the welfare of the cotton trade of this great country.

In conclusion it may be pardonable and permissable to refer with pride — a natural, just and estimable pride — to the fact that the United States of America is blessed with unequalled and illimitable resourccs not enjoyed by any other country on the face of the earth. Nature having endowed the American continent with everything necessary to the comfort, well-being and advancement of man, we may reasonably anticipate in the near future a material progress never before surpassed or even equalled in the world's history. The cotton trade of this country both North and South will naturally share in this progress, and has undoubtedly a future before it, which, guided by wisdom and judgment, will be the envy and admiration of all ages.

Mr. A. T. ATHERTON. I have been greatly interested in reading the able presentation of the question of the relations of employers to employees in our cotton mills, by Mr. WALMSLEY, and think that his position in regard to the matter is simply unassailable, but I have thought that another matter of the same trend could with great pertinacity be added to it and not detract from the force of Mr. WALMSLEY'S arguments.

It is stated, and to my mind with the greatest reason, that there is nothing that will tend to the preservation of peace throughout the world as the great progress that is being made in the perfecting of fire-arms and other implements for the destruction of life, because it cannot be otherwise than apparent to the different rulers of nations that a test of battle to decide their differences would mean an almost total annihilation of the forces engaged, and this thought will be sufficient to induce them to exhaust every other means of settling their differences before allowing themselves to be drawn into battle, and the use I would make of this illustration is this:

I am not conversant with the condition of affairs which exists in the matter of capital and labor in any States except Massachusetts and Rhode Island, but in these States is found a splendid aggressive organization of the so-called friends of labor, and a total want of anything approaching organization on the part of the cotton manufacturers for the purpose of meeting the assaults of the labor organizations and the result is invariably the same — the labor organizations practically accomplish all that they start out to do.

I have noticed that from the very day the different State legislatures meet to the end of the sessions, the representatives of the labor organizations are on hand to effect legislation in their interests, and the first intimation that cotton manufacturers have of the passage of measures inimical to their interests is the

publication of the same in the papers as having passed both branches of the legislature and received the approval of the governor, and then said governor comes in for a large share of condemnation for doing something which he could not prevent doing and be faithful to his oath of office, for the reason that as the measures have been received in the usual manner into the legislatures and referred to the proper committees, which in the absence of any opposition have been reported favorably from said committee to the different houses, and in the absence of any opposition there they are passed and sent to the governor for his signature, and he, knowing that there has been no opposition to the passage before reaching him, has no reason to suppose but that they are popular measures, and has really no reason to do otherwise than to approve them by his signature.

Now, we all know that all or nearly all the measures introduced by the so-called labor reformers, are in reality of the greatest injury to the employees as well as employers, and any action taken by employers to anticipate and circumvent the doings of these labor agitators would redound to the benefit of both parties for the reason that Mr. WALMSLEY aptly states, that capital and labor cannot be antagonistic to each other without being an injury to both, and I would respectfully suggest that it would be for the interest of cotton manufacturers to copy the tactics used by their opponents and organize themselves for the contest, and when the time comes those opposed to them will perceive the condition of affairs, and seeing a bold front presented to them will hesitate before entering upon a contest which must surely end in defeat if not annihilation; and the way to lead to such results is for the cotton manufacturers of the different States or the country to organize and have their committees present at every session of the legislature and watch every measure that is presented, and when anything is received relating to cotton manufacturing interests to report the same immediately in order that the objections to the measures may be formulated and presented at the proper time, and those

members of the legislature who are now catering for the so-called labor interest votes, because their advocates have no opposition, will hesitate to array themselves against a strong organization of cotton manufacturers, and the result will be the transfer of their votes and influence to the side of the manufacturers.

Now, I do not allow any man to have a greater interest in the welfare of the laboring classes than myself, and when I am proposing the measures for the protection of the manufacturers I am advocating what would be of the greatest interest to the employed and, according to my illustration, when both the forces of the employer and employee find themselves arrayed against each other and with the same effective weapons held by each, I cannot but think that everything in the matter of differences between the parties will be settled in a more amicable manner and that legislation hostile to manufacturers will cease and both they and the employees be benefitted thereby.

The PRESIDENT. The last paper on the list is, "Sea Island Cotton," by Mr. ELIAS L. RIVERS, of James Island, S. C.

SEA ISLAND COTTON.

Mr. ELIAS L. RIVERS, James Island, S. C.

ORIGIN.

Sea island cotton, a plant botanically distinct from upland cotton, is derived from the arboreal or tree variety as distinguished from the herbaceous or shrub variety. Although the islands upon the coasts of South Carolina and Georgia are usually regarded as the home of this cotton, and although its seeds grown here and cultivated elsewhere soon cease to produce a fibre with that long and silky quality which characterizes the products of these islands, yet this locality is not the native habitat of the plant. Brought probably originally from Persia to the Barbadoes, it was grown and known there as "Persian cotton," and when carried thence to the Bahamas it was known there as "gossipium Barbadense." Two years after those "eight bags of American cotton were shipped to Liverpool in an American vessel," to wit, in 1786, experiments were made with the cultivation of this cotton upon the coast of Georgia with seeds brought from the Bahamas, but owing to the perennial character of the plant it failed to mature seed. Fortunately for the experiment the winter of 1786 was very mild and some seed ripened upon the ratoon the following season, and this is said to have been the beginning of its cultivation in this country. In 1788 Mr. ALEXANDER BISSET grew upon St. Simon's Island upon the coast of Georgia, the first known bag of this cotton in this country, and in 1790 Mr. WILLIAM ELLIOTT grew upon

Hilton Head the first bag in South Carolina. For, although Mrs. KINSEY BURDEN of Colleton County, South Carolina, experimented with some Bourbon cotton in 1788, the plants did not begin to bloom until September, and failed to ripen any seed.

In the inception of the cultivation of this plant, those engaged in the experiment were met by this serious difficulty resulting from the nature of the plant itself, namely, the lateness with which it matured its seed. In its native country, perennial in its habits, unlimited in its development by meterological conditions, it grew and bore seed for three or more years and expended many of the first months of its existence in making growth before beginning to ripen any seed. But when brought to this country where by reason of its susceptibility to frost influences it had only from the first of April to the first of November in which both to develop and mature, it was observed that so much of this period was expended in making growth that but little seed was matured before the plant was killed by frost, and the harvest so reduced as to render the crop unprofitable to the planter.

To counteract this difficulty, a system of fertilization and cultivotion had to be adopted which would accelerate development and then arrest it in order that the greatest possible time should be given to the process of maturing seed. To attain this end, recourse was had to the high beds so common in sea coast cultivation, whereby the land was more readily warmed in early spring, and the growth of the plant thereby stimulated, and then by having large herds of cattle upon these fields the year previous to their cultivation in cotton, the bases of the beds upon which the cotton was to be grown, and which are usually five feet apart, undisturbed by plow or hoe, were rendered so firm by the trampling of cattle as to arrest the further growth of the plant when reached by its roots. It thus became the general practice to use the fields the year before their cultivation in sea island cotton as pasture, in order that this hardening process might take place, and then to intensify it by spreading in these

bases locally called "alleys," mud or clay dug from the neighboring creeks. But even then, before the free use of phosphatic fertilizers it was common to hear of serious losses resulting from an early frost. Of course, in all these years the nature of the plant was being modified by soil and climatic influences, by selection, and by the method of treatment above described, so that in 1860 it was a very different plant from that which was grown in 1786. Besides, it seems to have conformed to the generally accepted law, that the best quality of any given variety of vegetable life is grown in its most Northern habitat, for we have now developed in this new and artificially made home of the plant the finest quality of the staple known to commerce. Since the opening up of the Carolina phosphate beds, and its liberal use by the growers of sea island cotton, its influence upon the maturity of the plant has been so marked as, with the assistance of under-drainage, to almost completely eliminate the risk from frost. In these one hundred years the character of the plant has been so modified as to be to-day practically an annual, although at first it was a perennial.

APPEARANCE OF THE PLANT.

Although much modified by the agencies above described, the sea island cotton plant is of large and vigorous growth, partaking of its ancestral tree characteristics. In fact, it will become quite a tree if not limited by poverty of soil or fruiting — on strong lands often growing much taller than a man on horseback. The leaves are heart-shaped and toothed, of deep green color, with large branches at the base of the plant, with long arms above the branches bearing six or more bolls; flowers of a deep yellow color, and although when first planted the bolls contained only three, in all recently selected cotton they have usually four and not infrequently five lobes. The seeds are black and either altogether clean, or slightly tufted at either or both ends, with a green or cream colored tuft. The staple varies from one and three-quarters to two and one-half inches in length.

PREPARATION AND FERTILIZATION.

Old planters regarded a year's rest of the land with cattle upon it as the best preliminary preparation for a sea island cotton crop. Forty-two one-horse cart loads of mud per acre dug from the adjoining creeks, with such amounts of marsh grass cut and brought in flats from the salt lands, barn-yard manure or cotton seed as could be secured were added. A few years before the war Peruvian guano was purchased as an adjunct to the domestic supply. Except mud and marsh, it is to be noted that both barn-yard manure and cotton seed when used alone are one-sided fertilizers deficient in their phosphatic ingredients, and when used in large quantity tends to stimulate growth into the period when maturity is desirable; and this may in some measure account for the limited amount of these fertilizers deemed profitable upon this crop. Under this system an average of one hundred and twenty-five pounds of lint per acre was regarded a fair return. The opening up of the Carolina phosphate beds and the attendant development of the fertilizer industry have not been overlooked by the present growers of sea island cotton, and planters now frequently use an application of from 600 to 1,000 pounds of commercial fertilizers per acre in addition to the home supply, and not unfrequently harvest 300 pounds of lint cotton per acre. In recent years the cultivation of the marrow-fat pea, followed by the cow-pea alternately with cotton, have given very satisfactory results.

CULTIVATION.

The old method of preparing the land was to spread the mud or other bulky manure in the alleys and to list with the hoe all the stubble upon it, thus forming the bed upon which the crop was to be grown. In the decomposition of the vegetable matter thus gathered together some nitrogen was evolved, and carbon, as an absorbent of fertilizing material, and as an agent for the retention of moisture in the soil, was supplied. Then, just be-

fore planting, this listing was bedded over, the hoe being again used as less apt to impair the tenacity and firmness of the land produced by the trampling of the cattle. The seeds were planted upon these beds in hills from eighteen inches to two feet apart, and the beds kept clear of grass and weeds by the use of the hoe, the plow being used only to run an "alley furrow" for furnishing mellow earth which was drawn up to the stems of the plants after each hoeing. The cotton was thinned by hand to one plant to the hill and the beds kept clean until the growing plants were large enough to shade the ground and thus prevent the further growth of other vegetation.

This practice is now modified by using the plow instead of the hoe, in both listing and bedding the land and in keeping the sides of the beds clean during the working season. The expense and difficulty of keeping open drains (the kind generally in use up to 1860) in working order, induced some planters to experiment with underdrains made of boards, but besides the assured removal of excessive moisture, the many advantages resulting from their use, especially when tiles are substituted for board drains, have rendered the adoption of this method of drainage by the most experienced planters general.

SELECTION OF SEED.

Much attention has always been given to the selection of the seeds of this crop. As early as 1805, KINSEY BURDEN of St. John's Colleton, South Carolina, began his labors in this direction, and was so successful that in 1827 he sold his crop for $1.25 per pound, when common sea islands were worth only 24 cents per pound, and the best grades from 35 to 60 cents per pound. Strength, length, evenness and fineness of staple are characteristics which must be secured in any desirable selection, together with productiveness and a proper proportion of lint to seed cotton. A standard of length having been determined upon, the planter searches for the individual plant which coming up to this standard most completely combines the requisites

above enumerated. The next season the seeds from this stalk are planted one in each hill and the product carefully and separately harvested. The seeds from this plot will usually plant about five acres the following year, and this will furnish enough seed to plant a fair sized crop the next season.

But the individual plant which most nearly combines these desirable requisites is each year chosen from the small plot, and these seeds year by year planted separately, so that once started a planter should have a fresh selection each year with which to plant his crop. The only disadvantage resulting from this plan is a probably increased delicacy of constitution of the plant resulting from this severe process of in and in breeding.

INSECT ENEMIES AND DISEASES.

The destruction wrought by the "cotton caterpillar," an insect entirely distinct from the "army worm," extends as well to sea island as to upland cotton. It was generally believed that this insect returned in destructive numbers every twenty-one years. For although it had appeared in greater or less numbers in various localities in intermediate years, it had destroyed the crops in 1804, in 1825, and again in 1846, and many old planters confidently predicted the destruction which occurred in 1867. But the insect has appeared in destructive numbers since that time, apparently without any regular periodicity, sometimes doing little damage, and at others coming in numbers sufficiently large to destroy the crop if not prevented by the efforts of the planter; and the explanation of these movements seems to be that every development of the insect is attended by a corresponding development of all its enemies, and when from any conditions, meterological or otherwise, this increase is checked, its enemies overcome it and its ravages cease. But the enemies then themselves decrease in numbers, and the insect again increases, until they are in sufficient numbers to destroy the crop. Much uncertainty prevailed among planters respecting the habits of the insect, the identity of the moth and of the egg, and

the length of time elapsing between each stage of its development, but thanks to the investigations of the Department of Agriculture these facts are now definitely ascertained, and guided by the information thus furnished any intelligent observer can watch the movements of the insect in his field, and with Paris green, which has come into general use since 1873, protect his crop from destruction.

The boll worm is another insect which sometimes injures the crop, but usually to so limited an extent in sea island cotton as to cause but little uneasiness. Rust, both blue and red, sometimes works serious loss, but whenever the lands are put in proper tilth these diseases seem to disappear. Of recent years a new kind of blight similar to that observed in the watermelon crop, has appeared in an alarming degree, generally in fields in a high state of cultivation. It is said to be due to a fungus which enters into and eventually blocks the circulation of the plant. The Department of Agriculture is now investigating it, and a remedy is hoped for from these investigations.

HARVESTING AND PREPARATION FOR MARKET.

In harvesting this cotton care must be taken to remove all trash and leaves, as the presence of these substances materially detracts from its commercial value. The method of going over entire bulk and removing by hand all leaves and yellow cotton (locally known as assorting) is both tedious and expensive, but no other plan has as yet been successfully adopted to attain this end. Whippers and similar appliances, especially upon the finer grades, being now discarded as rendering the staple dryer and more open than the exactions of the trade require. But the greater perfection of the bolls resulting from the liberal use of fertilizers and the better physical condition of the land attained by underdrainage, has, for those who have availed themselves of these advantages, so diminished the amount of yellow cotton as that now a laborer can prepare twice as much cotton for the gin as formerly, and that in so much better condition as to do

away in great measure with the additionally expensive process of what is locally known as "moting," a method by which all ginned cotton was carefully gone over, and all defective and discolored staple and all cracked seed and trash removed, two laborers now doing that which was formerly the work of fifteen.

Old planters were slow to avail themselves of the advantages of the gin invented by F. McCarthy of Alabama, about the year 1840, the bulk of the crop being prepared for market upon the foot gin, until a few years before the war, when this gin came into general use; but because of the difficulty of properly adjusting it and the use of improper motive power, an average of from 200 to 280 pounds of lint per day to the gin was regarded a fair result. The essential parts of this gin have been set up in a most substantial manner by the Platt Brothers of England, and the old gin so much improved that it is not now unusual to obtain from 700 to 1,000 pounds of lint per day to the gin when properly adjusted and driven by steam.

All sea island cotton was formerly sent to market in round bags weighing from 300 to 350 pounds each, the cotton being packed by hand, a man standing in the bag and forcing down the cotton with an iron pestle. In recent years, while the bulk of the crop grown in Georgia and Florida is sent to market in square bales, nearly the entire Carolina crop is still packed in round bags; but in the place of hand and pestle the cotton is packed into the bag by means of an iron disk as large in diameter as the diameter of the bag, which is moved up and down by means of cog wheels attached to a crank in the hands of two men; but whereas a laborer usually took a day to pack one bag with the pestle, with the disk and cogs two men pack from six to eight bags in the same time. The average weight of these bags is about 350 pounds, although many planters send their crops to market in bags weighing 400 pounds and upwards.

TERRITORY.

The Encyclopædia Britannica in its article on the subject of cotton, mentions the superiority of the sea island cotton grown upon the islands of the coast of Georgia, but makes no illusion to the fitness of the islands upon the Carolina coast for the growth of this plant and of its successful cultivation there.

In an article upon the subject of sea island cotton prepared by THOMAS SPAULDING, Esq., of Georgia, and published in the *Southern Agriculturist* in January, 1835, the following statement is made respecting the territory in which this plant can be grown: "The only essential property that is required is a saline atmosphere; with it any soil in Georgia or Carolina may produce fine cotton, without it no soil will produce fine cotton. It is within this district of country from Georgetown in South Carolina to St. Mary's in Georgia, and extending not more than fifteen miles from the sea to which the sea island cotton is still confined. Whenever it has been carried either South or North or West beyond these limits a certain decline in quality has followed its removal." And yet to-day, while its cultivation upon the coast of Georgia has been practically abandoned and upon the Carolina coast much curtailed, the bulk of what is known as sea island cotton in the markets of the world is grown in Georgia, in the territory lying between the counties of Screven, Emanuel, Laurens, Johnson, Wilcox, Worth, Dougherty, Baker, Miller and Decatur and the ocean; and in Florida in all counties east of Gadsden; but the quality of all cotton grown both in Georgia and Florida is much inferior to that grown upon the Carolina coast, and both Georgia and Florida growers are obliged to renew their seed by purchases from the islands upon the Carolina coast. For although the seed grown upon the Georgia islands would preserve the distinctive characteristics of the staple, yet the abandonmeut of its cultivation there necessitates the purchases from the Carolina islands.

In Florida there is grown a grade of cotton known in the sea island markets as "East Floridas," superior in quality to all

other Georgia and Florida cottons, and being grown nearer the coast is said to degenerate more slowly than that grown in any other part of Georgia or Florida. For it must be borne in mind that the degeneracy here spoken of is in reference to the staple and not to the plant, it remaining ever distinctively sea island cotton, but the staple year by year becoming shorter and shorter until it is undistinguishable from upland cotton.

SUPPLY.

In reviewing the records of the crops of sea island cotton it is observed that in 1875 the total crop was a little less than 15,000 bags, of which Carolina grew 4,756 bags or nearly one-third, Georgia 1,213 bags or nearly one-tenth, and Florida 8,950 bags or nearly three-fifths, and yet this crop has so increased that in 1894 the total crop was 74,628 bales, of which Carolina grew 5,894 bags, Florida 15,031, while Georgia grew 53,703 or more than two-thirds of the entire crop. Of these crops, while the American takings in 1875 were only 1,915 bags, they had increased in 1894 to 34,765. These figures reveal the surprising fact that the demand for this commodity has so increased as to require a crop nearly five times larger than was used twenty years ago.

In the paper above alluded to, written over sixty years ago, Mr. SPAULDING thus speaks of those engaged in the cultivation of sea island cotton: "Whether it is that the cultivation of sea island cotton has afforded fewer inducements than other subjects of cultivation, certain it is that those engaged in it even within these limited districts have not greatly increased, and it is the successors of the first cultivation that are still engaged upon this object. They are generally an educated people, and a stationary one, less anxious after change than their countrymen are supposed to be, and although severly smitten in war by England, and in peace by the National Tariff, they have still clung with some degree of fondness to the places where they were born, and to the seas in which they were bred," and while to-day the

bulk of the Georgia and Florida crop is grown by small farmers whose cotton is prepared for market at public or toll gins, and a large proportion of the Carolina crop is grown by the colored population, who also gin their cotton at public gins, the comparatively few planters who under changed conditions conforming in modified degree to Mr. SPAULDING'S description, still continue its cultivation, are, like the planters of his day, merely the descendants of those who had previously followed the same occupation.

The PRESIDENT. This completes our list of papers. We have, however, a list of Topical Questions, and on some of these questions members of the Association have prepared short statements or essays, and I will take up, with one exception, these topics which have been so discussed.

30. Tare on cotton. Is it not excessive? Can agitation among manufacturers have any effect to reducing weight of hoops, sacking, etc.?

Mr. STEPHEN A. KNIGHT. Mr. President, "Tare on Cotton" is the subject of the paper which I have been requested to prepare and present at this meeting.

Is it excessive? Can agitation among manufacturers have any effect to reduce weight of hoops, sacking, etc.?

I am fully aware of my inability to do this subject justice; and only loyalty to our esteemed President prompts me to attempt it at all.

The limited margin left for the cotton manufacturer of to-day, makes this a question of great importance.

It is hardly necessary for me to state here the terms and conditions under which cotton is purchased by the American man-

ufacturer. I find by a series of careful investigations, that the average weight of seven hoops — which is, I believe, the number allowed on each bale — is about 8 1-4 pounds; the weight of sacking on same about 12 3-4 pounds, making a total weight of hoops and sacking of 21 pounds.

It has also become the custom — and custom in this case makes law — that if a bale of cotton, from any cause whatever, falls short in weight to an amount not exceeding five pounds, the buyer has no redress; and it has come to pass that nearly every bale that we get falls short five pounds or more, so that we are sure to lose five pounds on every bale that we use.

This amount added to the weight of hoops and sacking, makes a total of 26 pounds per bale. At 10 cents per pound this would amount to $2.60. We get for hoops and sacking an average, say of 10 cents per bale, which amount deducted from $2.60 leaves a net loss of $2.50 on each bale of cotton bought.

It is an easy matter for each consumer, when he counts the number of bales he uses monthly or annually, to estimate the loss he sustains in this way.

According to statistics furnished by Dennis Smith & Co., Memphis, Tenn., the takings of northern mills in the season of 1893-94 was 1,580,000 bales, and of southern mills 711,000, making a total of 2,291,000 bales. At $2.50 per bale this would produce the enormous sum of $5,727,500, supposed to have been paid for cotton, but as a matter of actual fact, for nothing at all.

While the foregoing are the conditions under which cotton is sold to American manufacturers, let us briefly glance at the conditions existing when this cotton is sent across the ocean.

I find by the same authority as quoted above, that the exports to Great Britain for the season of 1893-94 were 2,861,000 bales, to the Continent and Mexico 2,371,000, making a total of 5,232,000. The above is purchased under the following conditions:

The invoice to be for American actual gross weight, less an allowance of six per cent. to cover bands and tare.

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The gross landing weight guaranteed to be within one per cent. of gross invoice weight. Any excess of weight in bands over 9 pounds for each bale to be deducted from the landing weight.

Should weight of bagging exceed 4 pounds per 112 pounds, the buyer shall have the right to claim for each excess an invoice price.

Is there any good reason why we should not, as well, get full weight exclusive of hoops and sacking?

The importation of Egyptian cotton has reached such proportions that it is worth our while to note the conditions under which it is purchased by our manufacturers.

The imports of Egyptian cotton into the United States for the season of 1893-94 were 33,606 bales. It is put up in compressed bales about three-quarters the circumference of American bales, weighing 750 pounds gross and is sold at actual net weight. The average tare is about 12 pounds per bale.

The purchaser of coal at the mines, or of iron at the smelting furnace gets 2,240 pounds per ton, and for a quantity of sugar or rice he gets full weight exclusive of cask or package.

The purchaser of wheat, corn, oats or any other grain is entitled to full weight or measure exclusive of tare. And so it is all along the line, pound for pound, measure for measure, with the single exception of American cotton sold for American manufacture.

Thus far we have found no remedy. Have we sought one? How much longer can we afford to ignore these facts, and how can we remedy the evil, are to us some of the vital questions of to-day.

It is an old saying and I believe a true one, that "If you do not ask for a thing as a rule you will not get it," and that rule applies just here.

It seems to me that the importance of this matter has hardly been realized. What can we do about it?

Just the best method for accomplishing the desired end, and

many other points of interest relating to this question have not been hinted at, but are left for the consideration of the members of this Association. I would have been glad if some pen more able than mine had written this paper.

It is said, and with a great deal of truth, that "Where there's a will there's a way," and if this paper serves to provoke some afterthought and discussion that will find "the way," then my effort has not been a useless one.

Mr. B. D. DAVOL. Mr. President, The tare on cotton has long been thought excessive by the manufacturer.

When the cost (to the grower) of the sacking, hoops, etc., is taken into account and the price at which he sells the same, it would seem as though there was no room for discussion on the justness of the system.

It is doubtful if the custom so long established can be changed.

It may not be a bone of contention between competitors, as they all buy in the same way.

It is true that the English spinners demand a deduction for tare, but do they not pay for it in the price of cotton?

The English and American buyers work in the same markets and it cannot be expected that the Englishman can purchase any cheaper than the American. If that is so, who pays for the tare unless it is the spinner.

The manufacturer, unlike the merchant, buys his cotton to use, and the question of tare is quite a factor in the cost of his product. He pays from 8 1-2 to 9 1-2 cents a pound for his cotton, including hoops, bagging, etc. He can get about 1-2 a cent a pound for the tare, netting him a loss of from 8 to 9 cents a pound on from 3 1-2 to 5 per cent. on the total weight he buys. This seems to be too much for him to bear alone, and when the allowance of 5 pounds per bale in case of short weights is added, it becomes still more of a hardship.

Below are a few tests showing the pounds of tare per bale, also the percentages of the same from different sections of the

cotton growing belt; and if the custom which now prevails is so firmly established that it cannot be changed, the table may be of interest to the manufacturer, showing in which section the tare will effect him the least.

Texas,	18.57	pounds per bale,		3.60	per cent.
Mississippi,	20.16	"	"	3.84	"
Alabama,	20.99	"	"	4.10	"
Kentucky,	21.29	"	"	4.24	"
Tennessee,	21.46	"	"	4.25	"
Georgia,	22.21	"	"	4.38	"
Carolinas,	21.52	"	"	4.85	"

A full discussion by the Association may bring out a plan whereby the evil may be partially remedied, possibly to the satisfaction of both seller and buyer.

Mr. WILLIAM D. PENNELL. Mr. President, The subject of tare on cotton is something which has been attracting the attention of all and disturbing the minds of many of the cotton manufacturers for many years, and although there has been a very general desire on the part of those who have to deal with cotton by way of purchase, or by its manufacture, to bring about such a change in the methods of buying as would secure more satisfactory results, there has been no united action in this direction, and no advantage has been realized.

The tare *is excessive* and should be remedied if such a thing is within the range of possibilities, and there appears to be no good reason why it may not be so considered. A very large percentage of the cotton bales received at the northern, and it may be so at the southern mills, contains much more sacking and iron than is necessary, and it is partially accounted for by reason of the defective system of packing practiced in many localities, the cotton being taken from the gin and baled without the use of the compress, requiring longer hoops and more pounds of bagging. Bales taken by the railroad companies and

compressed for convenience in hauling (if I am correctly informed), and as the detail weights are made up for the bales as they appear in the original packages, no material is cut off from the ends, no matter how much surplus there may be, and the extra and *excessive* length of iron hoops is not cut off, but left for the benefit (?) of the manufacturers.

All of this indicates a wrong, somewhere in the system, which cannot of course be put upon the shoulders of the companies transporting the cotton. It is much more convenient for them in loading and carrying after compressing, and equally beneficial to those who have to store it at the mills.

And in this connection it seems there is abundant room for improvement in putting up or baling cotton so far as the coverings are concerned. A large majority of the bales put upon the market are wretchedly packed, subjecting manufacturers to many difficulties, and there is a growing necessity for more secure packing, and greater care in pressing and covering. As it is, the bales get badly mixed in transportation, those with marks nearly, if not entirely, obliterated, causing an endless amount of annoyance and confusion. A large number of bales are put up in such shape that the cotton is badly exposed and allowed to collect grit and dust, when left in dirty places, as is frequently the case, gather mud and water when brought in contact with either, and if exposed to wind in being conveyed from place to place is certain to sustain more or less loss, and while the wrappings are heavy and bulky, causing excessive tare, the cotton is in no condition to be carried any distance from the plantations, and presents a condition of things that is radically wrong, and one that should be remedied, together with the matter of excessive tare. Smoother and lighter sacking, with improved marking, is very much needed. It is decidedly unreasonable that we are called upon to pay for old bagging and iron hoops as much per pound as is demanded for the various grades of cotton. An average bale of cotton weighs not far from 500 pounds, and of this aggregate weight we find an aver-

age of about 12 pounds of bagging, for which we can obtain, after removing it from the cotton, say 5-8 of a cent per pound, and from 6 to 7 pounds of iron hoops which are worth in the Boston market to-day just about 25 cents per 100 pounds, or 1-4 of a cent per pound. These two articles together averaging not far from 19 pounds, and netting the manufacturer about 9 cents (varying somewhat, according to the distance from the iron markets), we are charged the market price of cotton for, and that to-day is 9 1-2 cents per pound for middling uplands, making the price about $1.80 per bale. The difference in price between low middling cotton and middling fair is not far from 1 1-4 cents per pound, and it is reasonable to expect this, as there is a very great difference in the spinning qualities of the various grades of cotton. The same grade of bagging and hoops, however, is used upon all grades of cotton, whether it be the cheapest or the most valuable, and we are required to settle for these *types of waste*, for such they really are, at prices precisely the same as that fixed upon the material within, which is as unjust as any one thing can possibly be.

The evils above mentioned are not the only ones that we have to contend with at the present time, as it is very clear to me that the uniform practice of forcing upon us the so-called "five (5) pound limit," whereby we are prohibited from an allowance for short weight unless that weight shall exceed five (5) pounds per bale, is a *gross wrong* and should be coupled with other grievances. As a very large majority of the invoices of cotton when received present a shortage of at least that amount, we practically meet with another *dead loss* of an amount varying only with the market price of cotton, but which at the present value of cotton is about forty-seven (47) cents per bale. This amount added to that remaining after deducting the nine (9) cents received for bags and hoops from the amount charged purchasers for the same materials, viz., $1.80 per bale ($1.80–$.09 = $1.71), gives us not far from $2.18 per bale, and a consumer using say 10,000 bales per annum is paying $21,800 for what? In round figures, nothing.

If there are any reasonable arguments that can be produced to justify this condition of things, it would afford relief to know just what they are, for it is utterly impossible for me to think of one *good reason*.

Personally, I am, and always have been, a firm believer in the idea of purchasing *net cotton*, no matter what the grade may be, or where purchased; I also know that *very many of our treasurers* hold this view; and there is certainly as much justice in it as there is in our asking and receiving pay simply for what we market in the line of manufactured goods *inside the packages*, whether it be ordinary prints or the finest and most expensive fabrics, no matter what the coverings may be. The protective materials we of necessity put outside our products, are of as much value as bagging and hoops, and in many instances of greater value. But very few, if any of us, ever even think of such a thing as demanding pay for wrappings.

I am well aware of the fact that in making such statements as these we are confronted with the statement that, if by reason of the united efforts on the part of *all treasurers* such a standard of purchase could be obtained, those who have the raw material to sell would be certain of realizing just as much through increased valuation of grades of cotton, and while there would be a distinction we should experience little, if any difference, so far as dollars and cents are concerned. But be that as it may, we could all afford to take the chances, permitting the law of supply and demand to regulate that, as it does the value of nearly everything put upon the market, and, if it should prove to be so, it would be a relief to the mind of the average man to know that he *was not paying 9 1-2 cents per pound*, or whatever the market value of cotton might be for 19 to 20 pounds of old bags and hoops, worth as before stated not far from 9 cents per bale.

There should be deducted, however, from every bale of cotton sold from *17 to 19 pounds tare*, just as tare is deducted from almost everything else that is marketed.

The system, to my mind, as practiced to-day, is entirely wrong, and I am fully convinced that with the proper amount of earnest effort on the part of all buyers, such an arrangement as has been designated could be established, and I am strongly inclined to the opinion that a very much more satisfactory feeling would prevail in the minds of agents, treasurers and all interested in the manufacture of cotton fabrics.

Having to forego the pleasure of meeting the members of the Association at Atlanta, on account of business engagements, I take this opportunity to pen a few lines to express in a measure my honest convictions upon this important question. And, while these few lines contain but a small portion of what can be said in this direction, if there is anything I have written that will insure a *full consideration of the subject*, I shall feel that some good has been accomplished.

There is a great field for thought and for talk along these lines, and I sincerely hope the talks and the papers presented by the different members may be of such a nature as to bring about speedy action and ultimate success.

36. What is the best number of wire and number of points, per square foot, for cylinders, doffers and flats, for the plain top card?

a. On breaker carding?

b. On finisher carding?

c. On single carding?

d. Also on the cylinders, doffers and flats of revolving flat cards?

Mr. Evan Arthur Leigh. Mr. President, The changes from hard foundation for cards, such as leather and cotton cloth, to the combined natural India rubber foundation, introduced by James Walton, led to the use of finer wire for cards than formerly. Again, the change from iron wire, or what was formerly called "mild steel wire," to hardened and tempered plough

ground polished wire of the present day, has further led to the adoption of finer wire and finer setting.

The conditions under which the cards work vary so much that a diversity of counts and setting will always remain to be settled by the observation and judgment of each carder, therefore it is vain to look for a formula to fit every case. There is little doubt, however, in the minds of experienced carders, that the fine points now obtainable in card clothing, whether by the use of finer wire alone or by plough ground wire, are most desirable, and when a fine point on wire, with an adequately strong crown or base, can be obtained, it appears to me that the ideal has been found.

With all the trials now going on, the fineness of the wire will probably not vary more than four or five numbers, and the setting not more than ten or twenty numbers; therefore the variation is narrowed down at present to a limit pretty well agreed upon.

When one thinks of the time when iron wire No. 30's was set in 80's or 90's clothing, he remembers that it did not save the wire from breaking out in a most remarkable and, at that time, inexplicable manner, but now attributed to the difficulty in cementing the foundations, and the experimental spinner has now a great deal to say on behalf of his venture with fine wire and fine setting, though the conditions are entirely changed.

The improvements in the making of steel and the making and tempering of card wire, have been reduced to a very simple and scientific basis in the few years just passed, and the wire is now tempered by the best makers in a way to secure uniformity hitherto unknown, and is entirely free from scale, while to crown all, the polishing gives a smoothness that is almost marvellous compared to the products sent out even ten years ago. The proper angle, and the height of the angle of the wire, also receive great attention, and it may now be said that these are settled upon a mathematical standard.

The making of cards has always been a very interesting and

important branch of manufacture, and one closely allied to the success of cotton spinning, and the improvement in the foundation and wire has already led to the opening of a new era in carding. Every mill at the present time may be regarded as a scientific laboratory engaged in the task of finding out what is the best structure, the best counts and the most suitable wire for carding.

The extra price of hardened and tempered steel wire is not considered an obstacle to its introduction, as it was at one time, for the advanced spinner knows that iron wire, though cheap, means poor results, more grinding, and the production on a high priced carding machine built more specially to produce quantity and quality, with inferior clothing, would be reduced in value from 30 to 50 per cent.

The standard settings are as follows:

60	70	80	90	100	110	120	130	140	150
28	30	31	32	33	34	35	36	36	36 or 38

Points per square feet:

43200, 50400, 57600, 64800, 72000, 79200, 86400, 93600, 100800, 108000

Stated in a general way, the clothing used for cylinders, doffers and tops may be put as follows:

Cylinders,	90's	100's	110's
Doffers,	100's	110's	120's and 130's
Flats,	90's and 100's	100's and 110's	110's and 120's

Plough grinding reduces the points several numbers, according to the amount of grinding. By the principal makers 32's is reduced to about 36's, thus leaving a strong wire in the foundation where the strain is greatest, and securing a fine working point, and a highly polished finish. As you are aware, the generally accepted theory is to have fine counts of wire for carding long staple cottons with light productions; but, after

all has been said, the choosing of the numbers of the wire and the counts, or the setting, must always rest, to a large extent, with the intelligent, observant carder.

40. What is the best running time for our mills? Best time to start? Best time to stop? Best length of time for noon hour, etc.? Any good points in the English method? Is there anything to be gained to the mills and employees by a standard uniform system?

Mr. ELLISON A. SMYTH. Mr. President, I am asked to discuss this question, I suppose from the southern standpoint. We know but little of the English method of hours and running time and only from observation and heresay, but our southern mill help are but recently from the farm, and the labor system there is breakfast by candlelight, dinner at noon, and supper after sunset. In our South Carolina mills we run sixty-six hours per week, and I advocate an hour's rest for dinner and play, and an early stopping on Saturday afternoons. This at Pelzer we find to be most satisfactory. There is nothing to be gained to southern mill owners, or employees, by a universal system or standard running time, for longer hours is about the only advantage the South has over New England. I believe we have nothing in nearness to the cotton fields, and are at a disadvantage as to railroad freights and hire of money, aud lack the skill and quickness and the ambition in our operatives which comes from long experience, or as a matter of inheritance. For this reason it is necessary to employ more hands to a given quantity of machinery in a southern mill than in a northern mill, and this of course tends to make the average pay less. The general character of the southern help, however, is excellent, their dispositions tractable while independent, and their future bright with a promise of constant and honorable employment, becoming themselves more skilled and ambitious, more saving and prudent, receiving and deserving better and better remuneration.

Mr. HERVEY KENT. Mr. President, In responding to the first question of Topic No. 40, What is the best running time for our mills, would say: we have for years run at the Exeter Mills on the following schedule, and as a matter of course think it best for us. From October 1st to May 1st we start at 6.40 in the morning, dinner from 12 to 1, stop five nights in the week at 6 P. M., and on Saturday at 4 P. M. From May 1st to October 1st we start at 6.10 in the morning, dinner hour the same, stop at 6 P. M. five nights in the week, and on Saturday at 12 M. This gives us sixty hours per week. If we were to make any change would start fifteen minutes earlier in the morning, during October and a part of November, and stop fifteen minutes earlier at night, as it is then lighter in the morning than at night. The objectors claim that this arrangement calls for ten hours and fifty minutes in a day, for five days of the week, rather goes against the idea that they should never work more than ten hours in any one day. We fail to see any serious objection when we consider the hours mills formerly run, and also the hours they run in foreign countries, to say nothing about those in some of the southern mills, it does not seem to be excessive.

The hours mills run in foreign countries, as given in the *Boston Journal of Commerce* of October 5th, is instructive as to the competition we have to contend with, they giving the hours run from fifty-six and a half to eighty per week.

We aim to meet the wishes of operatives every time, when it can be done without loss to the mill, and as a result, we have never had a strike, are never short of help (except from sickness), have no trouble in running extra to make up for any loss by stoppage of the mill, when it can be done the same week. Our help look forward to the summer arrangement with much pleasure, as it gives them a half-holiday as compensation for their longer confinement during the five days of the week. This is like most other things desirable — can have them only when we are willing to pay the price. As to the question of the English method of running mills, we fail to see anything we could

gain by adopting it, as we are informed they start at 6 A. M., stop at 8 A. M., thirty minutes for breakfast, dinner from 12.30 to 1.30 P. M., run five days in the week until 5.30 P. M., and on Saturday shut down at 12.30 P. M., the help remaining until 1 P. M. cleaning machinery, etc., making fifty-six and a half hours for the week. Some claim a gain by stopping for breakfast, thus giving the help a breath of fresh air, but we are told, on good authority, that three-fourths of the help bring their breakfast in, eating it while the mill is shut down; that being the case, we think our system the best. On the score of health we claim it is better to have breakfast before breathing the air of the mill. They may gain by starting before schedule time; if so, it gives them twice the chance.

The last question, "Is there anything to be gained to the mills and employees by a standard uniform system." Yes, much, if it were possible to bring the manufacturing world, or even the mills of this country, to agree to make sixty hours per week the standard, with a national law in accordance with it, the maximum of running time. Those now running longer time may object, but the time is not far distant when they will have to meet the question of shorter hours. If all were to combine now the time might possibly be held at sixty hours. It is well known that the agitators have no idea of limiting the time to nine, eight or even seven hours per day, nothing short of six now named by some. The only way to head off this foolish agitation is for all to combine under a national law. It is not so much the work of the laboring class as the cheap politicians "who toil not neither do they spin." It is their stock in trade, whereby they get a living from those who do work, except when they are sent to Congress to save the expense of supporting them at home. It is not for the best interest of the employees to war upon the industries of the country, making it impossible for capital to receive a fair return on their investments, for when looking from a fair standpoint, their interests are mutual. We are willing to concede that the agitators have done some good in getting

shorter time for the mills generally, but we have now reached a point which is fair and right for all parties, and it is but reasonable that we now make a stand for sixty hours per week, which could be mutually adjusted, only for the influence of politicians, or the walking delegate, who might find himself a back number and be forced to work, beg, steal or starve. Of course those now running fifty-eight hours would be glad to have sixty the standard, or have all adopt their time.

We fear they are much in the condition of the fox in the fable, who, having lost his tail in the trap, worked hard to have no tails the leading fashion; we did not hear of his gaining many converts.

41. What type of boiler is most economical for high pressures, cost of installation, operation, and depreciation being considered?

Mr. F. P. SHELDON. Mr. President, This topic is too broad and important to give an arbitrary opinion on, although I have pretty positive convictions on the subject.

42. Is the economy obtained with steam jacketed cylinders sufficient to warrant the extra cost and risk incurred by their use?

Mr. F. P. SHELDON. Mr. President, I should say positively, no.

The PRESIDENT. I will ask Mr. ECCLES' opinion as to topic

43. Is the cone warper an improvement? If so, in what respect?

Mr. JOHN ECCLES. Mr. President, We are running the latest improved Draper Cone Warper and are highly pleased with the machine. The cone drive we consider a great improvement, as the cone governs the tension on the yarn.

When the beam becomes fuller and the spool diminishes in size the cone lessens the speed of cylinder, thereby overcoming the great strain on the yarn by reducing the speed on the spool. More work can be produced with less breakages and better warping generally.

Girl can run more machines.

The PRESIDENT. I will also ask Mr. EBEN S. DRAPER for his opinions on this question.

Mr. EBEN S. DRAPER. Mr. President, The success of the cone drive for warper is proved by the very large number of them in use.

The object of the cone drive is to reduce the strain on the thread in the process of warping, to increase the efficiency of each machine, and also to cheapen the cost of warping by enabling one operative to warp more pounds.

In a common warper the speed of the cylinder is uniform from the empty to the full beam, while the speed of the spool is variable from the full to the empty spool. When the beam is empty and the spool is full, the cylinder running at a given speed, the spools revolve very slowly in winding a given amount of yarn, because the diameter of the spool is large; that is, with a spool having a 4-inch head the outside diameter of the yarn mass is about 4 1-4 inches. When the beam is full, and the spool is nearly empty, the cylinder speed of the warper being the same, the speed of the spools is more than double, because the diameter of the yarn mass is less than half what it was when the spool was full, therefore the spools themselves have to re volve more than twice as fast to deliver the same amount of yarn. The result of this is that common warpers which have an even cylinder speed, have to be run at such a speed that when the spools are nearly empty the breakage of ends or strain on the yarn will not be excessive. This, of course, makes the speed

of the warper when the spools are full, altogether slower than is necessary or desirable.

The cone motion obviates this very real and apparent difficulty. When the spool is full we drive the cylinder much faster than is done in the ordinary warper, still of course, being careful not to drive it at an excessive speed. As the spools deliver their yarn, the position of the driving belt on the cone is varied gradually until, when the spools are empty, the cylinder speed and spool speed are just the same that practice has determined to be right in the common warper. The result of this is perfectly apparent to anyone. You have, of course, gotten a very much increased average of cylinder speed without any increased strain on the yarn over the amount that practice has demonstrated in the common machine to be perfectly satisfactory. Of course you have not broken any more ends in filling a beam, yet you have filled your beam in much less time.

It is of course very evident from this, that a girl running three or four warpers with the cone attachment, will take off a great many more pounds of yarn than a girl with the same number of common warpers, without it. The yarn will be better warped, and there will be a great deal more of it per machine and girl.

We do not think it is an exaggeration to say that a warper driven by our cone motion will produce from 25 to 33 1-3 per cent. more work in a given time, than a warper without cones. This means, of course, a smaller number of warpers, in the first place, a smaller number of feet of floor space to turn out a given amount of work, and a reduction in cost of warping from 25 to 33 1-3 per cent. over the best common machine.

We introduced the cone warper in the fall of 1891. It has therefore been on sale for four years. Two of these years have not been good business years, as you know, so the number of warpers sold is naturally less than the average. In this time, however, we have sold and received orders for 670 machines; 304 of these machines were on original orders, and 366 on duplicate orders. We think no stronger argument than this can

be made of its efficiency, especially when it is considered that the price of these machines is from $50 to $75 each more than the price of the machines with which they compete.

To show some of the people who have tested the machines and then ordered more, we will mention the Berkshire Cotton Manufg. Co., Adams, Mass., who ordered 5, and have since ordered 18 more; the Grosvenor Dale Co., No. Grosvenor Dale, Conn., first ordered 2, other orders 16; the Massachusetts Cotton Mills of Lowell, Mass. and Georgia, first ordered 2, other orders 16; the Ponemah Mills of Taftville, Conn., first ordered 1, second order 30; Social Manufg. Co., Woonsocket, R. I., where the device was originally tested, have ordered 18 in all, and there might be, of course, a great many other concerns mentioned.

The cone device cannot be conveniently attached to old warpers. We believe, however, that any mill having common warpers would be wise to consider throwing them out and replacing them with new machines containing all the latest improvements, rather than continuing to run machines at a disadvantage of from 25 to 33 per cent. in the cost of product, and the furthermore important disadvantage of not doing as good work because of the extra strain that it usually brought to bear on the thread in the process of warping.

The PRESIDENT. The next question is No. 44, "Will a picker take out more dirt by introducing air in the end of the bonnet than it would to draw the air over the grid bars?" I will ask Mr. ATHERTON to open the discussion.

Mr. A. T. ATHERTON. Mr. President, In answer to topical question 44, "Will a picker take out more dirt by introducing air in the end of the bonnet than it would to draw the air over the grid bars?" I would say decidedly that it will, and for the following reasons: In taking cotton as it first comes from the

bale or the cotton gin, it is found to contain a considerable quantity of the different matters which enter into the formation of the cotton boll and which have not been removed by the process of ginning the cotton, and prominent among these matters are the leafy substances which enclose the cotton in the boll. A considerable portion of these substances is nearly as light as the fibres of the cotton, and during the working of the cotton they are liable to pass forward with the cotton, so that in order to prevent such a result various devices and means have been tried to obtain a happy medium in the draft in a picker so that it shall assist the cotton through the machine and allow the leafy matters to remain in the picker.

During my experience of twenty-five years, devoted almost entirely to the construction of cotton-picking machinery, I have found that when air is admitted between the grid bars beneath the beaters, that it is the means of preventing the light leafy substances from dropping through the bars, and then there is no other opportunity presented whereby the leaf can drop and be removed from the cotton on the machine.

I have always found that the nearer I can approach to a dead air chamber beneath the grid bars of the beaters, the greater will be the amount of leaf and other foreign matters that will drop into this chamber, and the best way to accomplish this result is by admitting air to supply the beaters through the ends of the beater bonnets and then there is no conflict between leaf, etc., endeavoring to drop into the dead air chamber and the draft of air for supplying the beaters through the grid bars in preventing it.

Some years ago, in common with other makers of picking machinery, I made what is known as a hollow shaft beater, thinking that perhaps I might be able to get enough air by this method into the picker to supply the beaters, but I found it was a failure for the reason that it was impossible to get enough air into the picker from this source to supply the beaters, as the openings into the picker from the hollow shafts nearest the

beater bonnet ends were so large that they exhausted the supply of air passing into the shafts, and the consequence was that no air was admitted to the centre of the machines and the laps were uneven and leafy.

I have tried openings in various parts of the picker for admitting air to supply the beaters, but have found that the best success has been achieved by admitting it into the machine through the ends of the beater bonnets.

Mr. H. C. PERHAM. Mr. President, My answer is yes, but at the expense of wasting cotton through the grid bars. Your question, as I understand it, virtually calls for comparison between a picker taking its air through the bonnet ends, all other inlets to the machine being closed, and one taking its air through the grid bars, all other inlets being closed, and on this assumption of the question I am satisfied to rest my answer as above. Allowing for a moment this answer to be correct and taking for granted that other objections to such a construction are sought for in these topical discussions, there would be an uneven distribution of the stock on the cages forming the sheet or lap from the first mentioned construction, as the draft would be much stronger on each side of the machine next perforated bonnet ends, than in the middle of the machine.

Summing up this construction I would say it is not practicable for the reasons above given, namely, wasting of stock through the grids and uneven distribution on the cages.

It is an established fact among picker builders that the air inlet to a picker and the outlet from same are important factors to its proper working.

I have been interested in various experiments to do away with the admission of air through the grids in hope of better cleaning — such as admitting it through perforations in the bonnet ends (the subject in question) through perforations in the back bonnet strip and through the front of bonnet over feed rolls. None of these, however, when used separately or in combination

proving satisfactory without an admission of air through the grids to overcome the wasting of stock through same and to aid in even laying of the fibre on the cages.

This question brings to mind the fitting up of a picker by Mr. RICHARD KITSON several years ago, wherein he had an air-tight compartment or chamber underneath the beater and admitted air to supply the machine through the first five or six incline bars, located between the beater and cages. After various experiments with the setting of the grid bars it was found that when set right to do good cleaning they threw out too much good cotton with the droppings, and when set close enough to overcome this defect the cleaning of the stock was impaired, and the idea was abandoned.

The hollow shaft beater, of which some 2,000 are now in use, carried out the idea of admitting air at a point remote from the grid bars, *i. e.*, through the shaft or the tube itself. The perforations in the shaft between the beater arms were graded, being much smaller near the sides of the machine where the air was first caught by the fan, than in the middle, so that an equal current of air found its way to the cages, consequently an even distribution of the stock was obtained.

This beater while being an efficient cleaner could not be worked successfully with its own air and not waste cotton, therefore a weak draft through the grids was resorted to.

The Kirschner French Carding Beater comes over here as a substitute for the old-style knife beater, and with it, elaborate drawings showing the bonnet ends and back strip perforated to admit air, slides for regulating same and quantities of instructions just how to do it, which all of you know would be followed by your picker tenders.

In practice, however, I find all these to be superfluous and first-class results have been obtained in over 300 instances already, without mutilating the machines, but by simply placing the beaters under the old bonnets, furnishing a new set of grids to go with them, and properly adjusting the air current through them.

Perhaps I am getting a little off the subject, as I notice this carding beater comes up in the next topic (No. 45), but I simply mention it to call attention to the fact that the Frenchman has gone all over this ventilating question, as he terms it, and after he bores holes in about everything comes back and lets the air in the old way to supply the machine, namely, through the grids.

I do not know of any way to get good, even and well cleaned laps better than using the right kind of beater in the right place, the right kind of grids and setting to go with it, and properly adjusting the air currents through the grids. I have failed to discover any way to do away with the air current through grids and get desirable results, but can do away with all the other devices mentioned and produce satisfactory laps.

45. The new French beater, its work on ordinary cotton and long staples.

Mr. FRANCIS H. SILSBEE. Mr. President, In reply to Topical Question No. 45, "The new French beater, its work on ordinary cotton and long staples," perhaps the results of a few experiments made with one of these beaters at the Pacific Mills, Lawrence, Mass., may be of interest to this Association.

Our system of picking, which was put in by the Kitson Machine Co., of Lowell, consists of opener, with one beater, feeder, and trunk; breaker, intermediate and finisher pickers, one beater each. Our finishers are each actually producing about 1,700 pounds of cotton per day of ten hours.

Our ordinary blade beater on the finisher picker makes about 1,400 revolutions per minute, and the fan about 1,368 revolutions per minute. The French beater we have been running at about 1,410 revolutions, and the fan at 923 revolutions. The French

beater is set so that the points of the teeth, or pins, are about one-eighth of an inch from face of feed rolls, or about the same as the blade beater. The grids are set much more open than with the blade beater, and so that they present a sharp edge to the cotton, and are also set much nearer the beater. In all other respects the two machines are alike.

Our experiments have been confined to "strict low middling" Texas cotton, about one, to one and an eighth, inch staple.

As an average of several tests we find that the total waste or dirt taken out by the French beater was about two and three-fourths times as much as with the blade beater. Of this waste 9.40 per cent. was taken from the "dust board," and contained considerable lint, but only about the same proportion as the similar waste with blade beater, where the "dust board waste" was 10.70 per cent. of total waste. The balance of the waste or "droppings" was quite free from lint with both the French and blade beater, and looked very nearly alike.

The laps produced with the French beater looked much cleaner and better opened, and on being held to the light showed that the fibres were laid much more evenly on the sheet. Yarn made from these laps looked cleaner, broke fully as evenly, and rather stronger than that from blade beater, and ran as well on both warp and filling.

I append a table showing the results of experiments more in detail.

Experiments numbers 1 and 2 extended over several days, the average results being given. Experiments numbers 3, 4, 5, 8 and 9 were made to determine whether any other speed of beater or fan would improve the work. In order to be able to report these experiments at this meeting, some of the tests were only continued for five hours, though reduced to a ten-hour basis, and of course are therefore not as reliable as if they had extended over longer periods. Experiments numbers 6 and 7, repetitions of numbers 5 and 2 respectively, were made to eliminate as far as possible any difference in amount of dirt in differ-

ent bales of the same grade by mixing four bales, and using half of this for number 6 and half for number 7.

From our experiments thus far we think that a speed of 1,400 revolutions of the French beater opens up the cotton better than any less speed, and that if the speed of beater is reduced the speed of fan should be increased, but with a speed of 1,400 revolutions of beater we found an increase of speed of fan above about 900, spread the fibres less evenly and made the lap more rough and lumpy.

If the French beater was put in the breaker and intermediate pickers we think the speed of beaters could very likely be reduced and yet obtain satisfactory results.

TEST OF KITSON FINISHER PICKER USING STRICT LOW MIDDLING TEXAS COTTON.

WASTE TAKEN FROM PICKER AFTER TEN HOURS RUN.

Experiment Number.		Revs. per Minute.	Total Waste in Pounds.	Percentage of Droppings.	Percentage from Dust Board.	Remarks.
1	Blade Beater, Fan,	1415 1368	4.489	89.3	10.7	
2	French Beater, Fan,	1410 923	12.340	90.6	9.4	Lap cleaner in appearance and fibres more uniformly distributed and better opened than in experiment number 1.
3	French Beater, Fan,	1196 918	12.519	87.8	12.2	Not as evenly spread as in experiment number 2.
4	French Beater, Fan,	1204 1060	11.758	89.3	10.7	Not quite as good as number 3 experiment.
5	French Beater, Fan,	1201 1142	9.797	90.6	9.4	Better than number 4 experiment. Almost as evenly spread as number 2, and number 7, but not quite as well opened, and rougher.
6	French Beater, Fan,	1201 1142	10.16	93.5	6.5	Almost as evenly spread as number 2 and number 7, but not quite as well opened, and rougher.
7	French Beater, Fan,	1410 923	10.57	87.5	12.5	Same as number 2.
8	French Beater, Fan,	1410 1077	12.92	90.9	9.1	Not as even as number 2 or number 7.
9	French Beater, Fan,	1410 1256	11.065	90.4	9.6	Not as even or smooth a lap as in number 8.

48. Is there any practical difficulty in the way of regulation of engines and water-wheels when working together?

Mr. ALLAN V. GARRATT. Mr. President, When we approach a question like the one in hand it is interesting to first determine if it is theoretically capable of solution.

From Newton's first and second laws of motion we know that a moving mass—such, for example, as a water-wheel and engine positively connected to driven machinery, cannot change its velocity if the actuating forces—in this case falling water and expanding steam—are just balanced by the retarding forces, which in this case are the friction of moving parts and the work being done by the driven machinery. As long as the foot pounds of energy liberated per second and the foot pounds of energy expended per second remain the same, the velocity will remain constant and will be equal to the velocity which was attained at the moment when the expenditure and liberation of energy were equal to each other.

For the sake of brevity we will call the rate at which energy is being expended, load; and the rate at which energy is being liberated, power.

Now we know that if the load is changed the power must be changed if we want velocity to remain unchanged. And the question becomes how much must we change the power when we change the load in order to have the velocity remain constant?

At first inspection this might seem a simple problem, but in practice it is a complex one, for the following reasons.

If power could be changed at the exact instant of time that load is changed all would go well, but this can never happen in practice. For example, if one-half the load and one-half the power were thrown off at the same instant of time the velocity would remain unchanged, but in practice when one-half the load is thrown off, the power is not changed until the velocity has increased enough to set the governors in action.

This increase in velocity means that for a short period of time

the power was in excess of the load and in order to bring the velocity back to its original value the power must for a short time be less than the load.

Now this is precisely where the difficulty comes in when power is furnished by engines and water-wheels working on the same shaft. Steam is elastic and is so light that its supply to the engine can be varied at will with the greatest facility. Water, on the other hand, is incompressible and is so heavy that its weight of flow through a turbine can be varied only with considerable slowness and difficulty, and even when the flow is varied, the inertia of the water itself invariably varies the effective head in a way which greatly impairs the effective power of the wheels. Also the wheel gates are much heavier than the steam valves and require a much larger actuating force to handle them.

The practical result is that with the ordinary forms of water-wheel governor, the engine governor acts first and gets through its work before the water-wheel governor begins. The latter then begins to act when it is too late, requiring a secondary effort on the part of the steam governor. For example, with a decrease of load followed by an increase of speed there is first a decrease of steam power to about the proper point, then a decrease of water power making the sum of the steam and water power less than it should be, followed by an increase of steam power to re-establish the balance between the total power and the load. This, of course, seriously interferes with the speed regulation.

It is thus evident that a satisfactory speed regulation cannot be maintained by an engine and water-wheel working together, and each supplied with a governor, unless the two governors work with the same degree of promptness, or to speak more accurately, unless they cause the engine and the water-wheel to maintain a fixed ratio of power while the total amount of power is varying from moment to moment, to correspond to the variations of load. And at the same time the ratio of total power to

total load must always be variable to counteract the slight changes in speed allowed to operate the governors.

Until within a year of the present writing the undersigned found it much better practice to run the water-wheel without any governor at all and rely entirely on the engine to do the governing, and with this arrangement a very satisfactory speed regulation can often be obtained if the load variation is not too large and the engine governor is of good design, and also if it is never desired to run the water-wheel without the engine. But as a general engineering propositian it is not wise to couple two power units to one load unless either can be run independently if occasion requires.

About a year ago the present writer found that with a type of water-wheel governor so designed as to set the wheel gates at the correct position for the change of load, irrespective of the temporary variation of speed referred to in the early part of the paper, it was possible to govern a water-wheel so closely that it could be run either with or without an engine with a speed variation not exceeding one or two per cent. in a textile mill. And even where the load varied instantly fifty or seventy-five per cent. of the total load the speed variation could be kept within three per cent.

"The test of the pudding is in the eating," and the writer would point to the Massachusetts Cotton Mill at Lowell, where Swain turbines are running considerably within two per cent. variation and can be coupled with an engine or not without affecting the speed regulation.

Another very interesting plant is at the Ponemah Mills at Taftville, Conn. In this case the water-wheels are five and one-half miles distant at Baltic, the power being transmitted to Taftville through a General Electric three-phase plant which acts as a rigid shaft, the motors at Taftville running at exactly the same speed as the generators at Baltic. The load often varies several hundred horse-power instantly. The load may be carried either by a steam plant at Taftville or by the water-wheel plant at

Baltic or by both together. In any case the speed regulation is entirely satisfactory.

If space and time permitted the writer could describe paper mills, electric light plants, electric railroads, machine shops and a variety of power plants where a very close speed regulation is maintained either by water-wheels alone or in combination with steam engines.

The elements of success in these cases being first a water-wheel governor that will set the wheel gates with great promptness to the correct position, combined with a high order of mechanical design in the general arrangement of the plant.

The experience of the writer has led him to set it down as a general statement that any water-wheel which is being governed as closely as a steam-engine, may be directly coupled with a steam-engine without disturbing the speed regulation.

As the question of accurate speed driving is one of great importance in the manufacture of textile fabrics it is to be hoped that it will be thoroughly discussed by the Association.

Mr. F. P. VOGL. Mr. President, In looking over "Topical Questions" I notice No. 48 covers a question that we have solved here and I offer our experience in that line. Our engine transmits power to main shaft at same speed as our water-wheels and all our regulating is done by the engine; the regulator is disconnected from the wheels and the gates on wheels are hoisted to use the water and keep same at top of dam; in this way all the water is used at full head and the engine makes up power needed to keep shafting at speed. We run three water-wheels and engine together in this manner and have uniform speed; our steam pressure is from 40 to 80 pounds, according to amount of water for the wheels. We have run this way for fourteen years and have never had any difficulty. We run two 30-inch and one 24-inch belt from our wheels, and one 32-inch belt from engine, and running as we do there is no practical difficulty in the way of regulation of engine and water-wheels when working together, if care is taken to keep watch of ponds.

Mr. EDWARD W. THOMAS. Mr. President, I have had some twelve years' experience in running water-wheels and steam-engines connected together. In one case some 1400 horse-power of water through seven water-wheels is connected with one double 23 x 60 Corliss engine and one single 22 x 36 Porter Allen engine. Owing to the low state of the water supply at times in the river, some of the wheels have to be disconnected and the power made up through increased power derived from the engines. The engines are run all the time, but the power varies as stated above. At no time in the year, whether the water power is at maximum or small, is any variation of speed noticed. The regulation is done through engine governors entirely, there being no governors on the water-wheel.

In another case in the same mill plant seven water-wheels are connected with a double 32 x 60 Harris-Corliss engine and a cross compound engine, the regulating being done by the governors on the engines. It is but fair to say, however, that at no time in either of the above cases is the amount of horse-power of water as much as that of steam, the steam being the larger factor in each case. What the results would be with these conditions reversed or where the water power is much the larger factor I do not know, not having had any recent experience.

Mr. WILLIAM B. FITTZ. Mr. President, I would respectfully submit my experience on the subject working under the following conditions.

Two water-wheels and an engine working together, one wheel perpendicular and one horizontal, 36 and 45-inch respectively, working under 26-foot fall of water, and one engine, new Wheelock cross compound 550 horse-power; the load on engine varying from 100 to 500 horse-power according to supply of water; setting the gates of water-wheels to take what supply of water there is to run.

We have found no trouble whatever, except when running as low as 100 horse-power or less, and then no more than would

naturally occur in running engine alone. We vary our steam pressure from 140 pounds maximum, to 90 pounds, minimum load, as required by supply of water to be used.

From the above facts we can see no reason for difficulty in running the two powers combined, if the engine is fitted with the modern type of governor as is now used by all first-class engine builders, and depend entirely on the engine to govern the speed.

Mr. JOHN ECCLES. Mr. President, From my own experience and from all the facts that I have been able to gather from others who are using these two powers together, there is no practical trouble in the way of regulation. Most mills of any size in New England are arranged to use both steam and water. Whether you regulate by steam or water depends somewhat on the conditions. It is a question of detail how it is best done in each case and no set rules can be given to answer all cases. It is generally advisable to regulate with the larger power opening the valve of the engine or raising the water-wheel gates to give a certain power, making up the balance with the engine or water-wheel and doing the regulating with the same. I do not think it is practicable to use a regulator on both engines and water-wheels where the power is connected together. The power will change quicker on the engine than on the wheel. I think the Lombard water-wheel governor will work as quickly as an engine governor. There are conditions where a certain amount of water is available in cases of this kind when the wheel should be gauged to take the amount of water, making up the balance of power with steam, and doing the regulating with same. Where steam and water are used together it is very essential to have a wheel that shows good results at part gate, as the power you develop on the wheel at different stages of gate is better for regulation. Where the flow of water varies during the day, and you are obliged to use a certain amount of steam at all times, it is advisable to do the regulating with the engine, pro-

viding there is power enough used to be economical and gauge the gate of the wheel so as to have the amount of water available used on the wheel with a full head. In many cases a great mistake is made where steam and water are used together in allowing the head to be reduced by using more water on the wheel than is available in the stream. The only cases where it is advisable to reduce the head is where there is a continual flow of water into the reservoir during the night; in cases of this kind the head should be reduced to that point during the latter part of the day, so that the pond will fill up during the night. There is no practical trouble in the way of regulation of engines and water-wheels together, as it is being done right along.

The PRESIDENT. No. 49, "What have you learned from your acquaintance with mill fires during the past year?" on which Ex-President THOMAS has prepared a very excellent paper by reason of a fire in one of his storehouses, and I will ask the Secretary to read this paper.

Mr. EDWARD W. THOMAS. Mr. President, The following relates not strictly to a mill fire, but to one, the details of which may prove interesting to the members of this Association.

In a cotton storehouse of wood, one story in height, about 172 feet in length and 130 feet in width, belonging to the Tremont and Suffolk Mills of Lowell, Mass., was stored the present season some 11,000 bales of cotton, packed solidly to a height of about twenty-two feet. Through the building was a brick fire wall running lengthwise and extending above the roof about four feet. Through this wall at intervals were four openings, each opening having fire doors on each side of the wall. The outer covering of the sides of the building was of 7-8 inch matched sheathing in widths of twelve inches and running up and down, the joints of the sheathing being covered with

battens two and one-half inches wide and 7-8 inch thick. The columns supporting the roof were of Southern pine, twelve inches square. The roof plank were two and one-half inches thick, Northern pine, tongued and grooved. The outer covering of the roof being the New England Felt Roofing Co.'s preparation, "Bee Hive Brand." About 5,000 bales of cotton was stored in one of the compartments and about 6,000 bales in the other. There were no doors or openings in the wooden sides of the building, the light being derived through windows placed in the roof. These windows were about 3 x 5 feet, and the glass of heavy ribbed pattern. The windows were about forty-eight feet apart on centres.

The building was bounded on three sides by public streets and on the fourth side by an open lot of land, furnishing an admirable opportunity for the firemen to battle with the flames. About three o'clock in the afternoon of August 26th, 1895, workmen about a new brick structure near at hand, heard an explosion and immediately smoke was noticed issuing from the storehouse. At this time workmen were engaged in obtaining cotton from the building for the regular daily consumption in the picker, Upon noticing the fire they ran into the building and closed the fire doors in the fire wall referred to above, but evidently too late for any practical benefit, as fire was discovered to be on both sides of the fire wall, it being very evident that at the time of the explosion the flames had been blown from one compartment into the other. An alarm was sounded at once from the nearest city fire alarm box; the department immediately responded, and in a surprising short time over twenty streams of water were being put through the windows in the roof and through openings cut through the sides of the building. A second alarm was sounded and additional streams were brought to bear upon the fire. There being a space of about two feet from under side of roof to the top of the highest bales of cotton, it was but a short time before the whole area of the building under the roof was a mass of flames. After about two hours' steady

fighting it became evident that no more of the building would be destroyed by fire. A large number of men were then put to work stripping the sheathing from the sides of the building for the purpose of removing the burning bales. The piling of the cotton in the house had been done with the utmost care and was packed as solidly as possible, but the lack of uniformity in the sizes and shapes of the bales naturally left openings and crevices into which the fire spread slowly in a thousand directions, out of the reach of any water that might be used. This was the most serious part of the fire. For days the city department had more or less of its members at hand fighting the fire as it broke out unexpectedly in the most out of the way places. Large gangs of men and teams were put at work removing the cotton from the building, and the public streets into which it had been thrown, to a field some hundreds of feet away, where the bales were stood on end. Hundreds of these bales contained fire, and gangs of men were employed day and night with fire pails seeking for small places where fire existed in the various bales.

This was continued for five weeks after the original fire. In one instance bales were completely submerged in an adjoining river and left some time, and when opened afterward found to be a mass of fire inside. Notwithstanding the fierceness of the fire it is believed but a very few bales were actually consumed at the time of the original fire, but many were found weeks afterward when being opened to be almost thoroughly burned up inside, leaving but the outer shell or covering.

From the best information at hand it is thought the fire originated from spontaneous combustion, the more damaged and destroyed bales being found at the bottom of the heap, near the centre of one of the sections. About two-thirds of the bales were burned to a more or less degree, and the balance of the bales more or less wet. By advice of the Associated Mutual Insurance Companies a temporary building 250 feet long aud 100 feet wide, 12 feet high, was erected in the above-mentioned

field, and as soon as completed, operations were begun in the line of opening each bale of cotton, throwing the burnt and wet portions into a heap, and wrapping the balance which was dry, tying up with ropes and sending to picker for regular daily consumption. Some two hundred people were employed in this shed, as well as on the second picking over of the wet and burnt portions. The total value of the cotton in the storehouse at time of the fire was over $400,000, and the amount or per cent. of salvage that will be obtained or the loss to the insurance companies cannot at this writing be fully named. This fire was the largest of its kind that has ever occurred in any cotton manufacturing plant, and one that from the experienced obtained, the writer never wants to see again. It was, however, a good object lesson from which not only the mill concerned but the insurance companies wlll derive valuable information.

The following conclusions may be drawn from our experience;

First. The inadvisability of storing in any one compartment of a storehouse (one story construction,) of over two thousand bales.

Second. To provide automatic sprinklers to be located under roof. Not that I think the sprinkler service would have materially affected the amount of loss in this particular case, but I do think that in a smaller compartment there would be much more water get into many of the crevices between bales where fire might exist than could be gotten in by the use of hose, and I think such sprinkler heads should not be less than seven feet on centres or more than eight feet.

Third. The slow burning construction as adopted in this building was very manifest, particularly in the columns and plank roof, dimensions of which have heretofore been given. The thin board sides of the building were easily removed or cut through during the progress of the fire, so that streams of water from various hose lines could be used from all sides of the building.

Fourth. The fire doors in a brick party wall opening from one compartment to another are a bad feature in storehouse

construction, as they must necessarily be left opon while cotton or goods are being put in or taken out, and at this very time of their being open, fire could easily spread from one compartment to the other, as was proven so conclusively in this case.

While all ordinary precaution was taken in storing the cotton in this house, it having been done in January and February of the present year, we are again reminded of the old saying, that it is the unexpexted that always happens. In the repairing and reconstruction of the storehouse plans have been adopted much in the line of the suggestions referred to above, and it may prove of interest to the members to give below some of the details proposed.

The building will be of wood, one story high, 325 feet long and 172 feat wide, 24 feet high in clear. Extending lengthwise through the building are two fire walls twenty-four feet apart and projecting above the roof of the building some four feet. Through the space between these walls will be laid the railroad tracks, and cars as received from the railroad people may be run the entire length of the building. Each of these two long sections of the building will be divided by four cross walls, making five compartments in each section or ten independent compartments, none of which will contain over two thousand bales. Openings are made through the longitudinal walls from the passage way with fire doors on either side, but no openings of any character are in the cross walls. The advantages of this is obvious. Should fire occur in any one of the ten compartments and should from any cause come through the door or doors into that compartment the flames would be in open air and have nothing combustible to feed upon. The doors leading into the compartments directly opposite each other are set off so that even an explosion could not cause any flame to enter the opposite compartment. All cross walls are run through the roof, forming battlements.

The sprinkler system adopted is to be of the dry pipe type, and each of the ten compartments is completely independent of

the other, so far as supply of water and drainage of system is concerned.

Once more it does not seem out of place to state, had the bales in this storehouse at the time of the fire been of uniform size or better shape, and could have been packed tightly together, the fire could not have worked in around and between bales as it did.

We also felt the disadvantage of not having the bales better covered, as all exposed cotton was burnt or scorched, and presented to the flames thousands of opportunities for the fire to work its way. Many of us know what this means.

In conclusion I may only add that at best we cannot surround ourselves with too many appliances for the prevention and suppression of fires, and what looks to us sometimes fancied requirements by the insurance companies may some day prevent a serious conflagration.

The PRESIDENT. I will ask Mr. A. H. GULLIVER to open the discussion on Topic No. 51, "What principle of first picker is least adapted for *a*, Middling American cotton; *b*, Long staple peeler, Egyptian and Sea Island cotton; *c*, What relation should the speed of the beaters in all picking-room machinery have to the grade of stock being used?"

Mr. ARTHUR H. GULLIVER. Mr. President, in taking up the above question shall refer only to the sections marked *a* and *c*, as I have not had any experience with mills under my own charge using the special kinds of cotton mentioned in section *b*. The long staple I have used in making fine yarns has been Texas cotton.

The preparation of the cotton for the first picking machine should before anything else claim our attention, as it is not possible to properly clean and mix the staple if large pieces of

coarsely broken cotton are used. No self-feeder will satisfactorily handle a piece of compressed cotton that will half fill the hopper. It must be broken into small pieces, and thoroughly mixed bale with bale, and lot with lot. This can be done by hand by using the yardmen to open and break the bales, when their time can be spared from their other work. This will be easily done if the bins are large enough to take from three days' to a weeks' supply for the mill. As much room as is available should be used for this purpose, as the cotton is in better condition for working if it has a chance to remain a reasonable length of time under the same conditions of temperature and humidity as it is afterward in the mill.

It is very poor economy to prepare cotton in small quantities for the pickers, if it can possibly be avoided. In many of the mills one or more men will be needed for the special purpose of opening cotton, which will give better results than taking the hands from their work in the carding-room for two or three hours at a time.

If there is enough cotton used to justify it, should be in favor of using a machine to decrease the labor cost, to open more evenly, and to mix more thoroughly. A bale breaker will do this better than by hand, and will keep the bins filled with well-prepared cotton.

The stock, thus opened, should be put through a self-feeder, it makes but little difference of whose make, provided it is strongly built, the bearings protected from sand and dirt, the movable parts as simple as possible with every care taken to prevent undue wear, iron or steel to be used for wood wherever it can be done, and so arranged that it will do its work without clogging. Any machine that will need weekly repairs or renewal of parts at short intervals, is a detriment to the mill, and it will be a good investment to replace it by one that is better built. The box or hopper should be kept nearly full, so that the lap will run even.

The feeder should be attached to a two-beater opener, pro-

vided with two-bladed beaters. It will be better to use no evener, as the feeder will give as satisfactory results without it. While we are using a Buckley opener on our two-beater opener, I do not see, from careful examination, any great difference in the waste taken out from that and the second beater, and see no reasons why as good results would not be obtained by using two-bladed beaters, and make the machine take up less floor space, and easier to clean.

In regard to the speed of the beaters, the shorter the staple, the less danger from injury from high speed, but it is better to run a little too slow than too fast. If your pulleys would give you 1,400 rather than 1,500 revolutions, you will lose very little by the slower speed.

Should think 1,500 on one inch, 1,400 on inch and an eighth, and from 1,200 to 1,300 on an inch and a quarter would be safe speeds. In several different mills have known of great improvement in the running of the work throughout the mill by decreasing the speed of the beaters.

52. If upright boilers are used, will the steam be made more cheaply by using all soft coal, or by mixing soft coal and buckwheat coal?

53. How much can be gained by usihg a forced draft, when the chimney draft is not enough to give thorough combusiion?

55. Can oil in condensed steam be separated by any means so that the water can with safety be returned to the boiler?

Mr. F. P. SHELDON. Mr. President, On topic 52 I would say, it depends entirely upon the cost of the two coals at the given locality.

On topic 53 would say, no definite answer can be given. It depends upon how poor the draft is and how much cheaper coal is to be burned with the forced draft.

On topic 55 would say, with single cylinder engines, that is,

simple and yet condensers, there is no difficulty at all in feeding boilers from the hot-well water. With compound or triple or quadruple engines there is sometimes more risk about it, but there is a filtering process which will purify the water sufficiently to avoid all trouble from oil. It is not the oil itself that makes trouble, but the combination of oil with sedimentary matter in the water. But it is with *surface* condensers that the serious troubles from oil begin to appear. A good many boilers have come to grief from using the return water from such condensers, especially with high pressures. Large street-railway plants with which I am connected, are deliberately throwing away this water rather than incur the risks of damaging their boilers, and this too at a very large annual cost for water. A few weeks later I hope to be able to offer something of positive value on this vexatious question, but at this writing I do not know of any *absolutely safe and certain* method for separating oil from the return water from surface condensers.

The PRESIDENT. I will ask Mr. A. F. KNIGHT to give his experience on Topic No. 55, "Can oil in condensed steam be separated by any means so that the water can with safety be returned to the boiler?"

Mr. A. F. KNIGHT. Mr. President, The method of lubricating the pistons and valves of steam-engines most common at the present time is to introduce the oil through a sight feed drop by drop into the steam pipe or steam chests.

The heat of the steam vaporizes the oil, which combines with the steam in such a manner as to make it quite difficult to separate them, and when cooled we find the oil so incorporated as to form a milky emulsion.

If steam from the receiver of a modern compound engine is

used to heat the feed water in an ordinary open heater it is certain to carry this oil into the boiler with it.

The boiler then acts as a separator and in one way and another the surfaces of the interior of the boiler become coated. A film of oil if it be ever so thin will resist the power of water to protect the metal from the terrific heat of the furnace. Hence follows leaky tubes, bulging of crown sheets, and all such evil results as would naturally occur if the metal of which the boiler is made is not protected from the severe heat of the fire.

Some experiments were made by the British Navy at Devonport Dockyard, in order to throw light on this, and also to ascertain the temperatures which were actually produced under practical conditions. The results of a preliminary series of experiments were given in a paper read before the Institute of Naval Architects, and some of the leading points contained in that paper are as follows: First, tubes remained tight in a tube plate up to a temperature of about 750 degrees Fah., but leakage must be expected when this temperature is much exceeded. Secondly, as regards the temperatures which were attained under different conditions of working, it was found that when boiling water under atmospheric pressure in a plain vessel, the temperature on hot side of plate was only 280 degrees with clean fresh water, but rose to above 550 degrees when the vessel was coated internally with a layer of grease 1-16 inch thick.

The effect with boiling water under pressure was obtained by experimenting with a smaller boiler. This boiler, consisting of a cylindrical shell with tubes and a brickwork furnace at one end, was worked with a steam pressure of 145 pounds, the rate of evaporation being about 12 pounds of water per square foot of heating surface per hour. Two trials, each of about five hours' duration, showed a temperature on fire side of tube plate of about 750 degrees Fah. At a third trial a small percentage of oil, .07, was introduced into the boiler, and the temperature rose to between 750 degrees and 1,060 degrees on the fire side. At the fourth trial a small additional percentage of oil, .05, was

introduced, and this caused the tubes to leak; the temperature became about 1,060 degrees on the fire side, and between 680 degrees and 750 degrees at the centre of the tube plates' thickness, representing the mean temperature.

The experiments were conclusive in showing the importance of keeping the water side of the heating surface free from greasy deposit and the water free from grease, and only confirms what is now well established in practice. To attain this end as nearly as possible, feed water filters are now commonly adopted in Her Majesty's ships, and also every effort is made to reduce the quantity of oil used for lubricating internal parts of engines to a minimum.

If, gentlemen, you have not had experience, let me warn you, if at any time you find evidences of oil in your boilers, to put in plenty of soda, or other alkali, warm up the water, and wash out the boiler thoroughly before putting it again into active service.

An open heater can utilize all of the condensation. But it must be properly installed. Suitable separators, and a reducing valve, should be placed in the pipes that carry the steam to the heater. The separators should have glass gauges similar to a water gauge, to show how high the oil is, and they should either be connected with traps, or properly designed loops, to prevent the oil from going over into the system. The reducing valve should never allow the pressure entering the heater to exceed one-half pound.

The heater should be arranged with a float valve to admit the water to a designated height and no higher. It should have a weir so that the water that goes to the boiler shall be taken from an underflow. It should also have an overflow outlet to allow the oil on the surface of the water to be drawn off and also to prevent it from going over the top of the weir. It is better to have the water sprayed into the heater as the heat of the steam is more quickly absorbed. We have at one of our mills such a heater which was installed about three months ago, and we have found no traces of oil in our boilers since using it.

Mr. ARTHUR B. MANN. Mr. President, In the different types of oil separators which are generally known, but two methods are used in the attempt to accomplish the much desired result, one by filteration and the other allowing the steam in its passage to strike surfaces directly in its path, with the intention of the oil in the steam adhering to the surfaces, and dropping into a pocket whence it could be drawn off.

There are steam plants which are successful in extracting their oil to such an extent as to have never had any trouble in their boilers, but there are more who do have,—dare they run the risk of attempting this most difficult of results.

That oil can be separated from water no one has any doubt; but after oil has been boiled, divided into such minute particles, and with the steam (and possibly cold water for condensing) constituting so large a volume moving rapidly, to be divided again, and to have pure water ready for the pump before the water shall have lost its heat, seems to me to be an impossibility. To allow the water to cool, say in a tank, you may be able to take out more oil, but not in total, nor with any quick process, or one machine.

Most of you have tried the experiment of taking a small quantity of the condensation from your engine, and allowing it to stand, say two weeks, in phial. In that time perhaps 90 per cent. of the oil will rise to the top, but the water will still be far from clear, and showing traces of oil — to what percentage no one can tell without analysis — and differing somewhat with different oils and different water; but is it not that uncertain percentage which we are to fear?

Of any machine yet seen for the purpose of eliminating oil from condensation, I believe there will still remain in the water this uncertain percentage of oil which is at all times liable to attach itself to the interior of the boiler, just as it will to the interior of one type of separator, the difference being that it can and will pass the separator, but surely not the boiler. It may take a longer or a shorter time to cause trouble dependent

upon the capacity of the separator, tendency of the feed water in use to scale, freedom of the oil from animal matter and other conditions.

The mineral parts of the cylinder oil will not in most cases hurt the boilers, as indeed mineral oil is often used for the prevention of scale and with good results. But the claim that it is only the mineral ingredients which are left after passing through the separator seem to me to need no answer on its face. Let me say right here that a home-made mineral-oil injector can be made at one-tenth of the cost of those on the market and will work just as well.

The fact that cheap oils are used to such an extent at present only aggravates the impractibility of a proper separator.

Several large plants in the West and two concerns in New England to-day, finding sulphuric acid in their feed water, have neutralized it with soda; but not so with oil; once in it is a constant menace, though potash in small quantities will undoubtedly help matters to a large degree.

If you are short of water or are using city water at high price, how much of it will it take to make the value of a new battery of boilers?

On the other hand, if you have plenty of water and only to pump it, surely the small item of pumping to-day by electricity cuts a very small figure as a running expense, and no figure in the first cost of a boiler plant.

Mr. WILLIAM P. DEMPSEY. Mr. President, We have an arrangement for collecting all our condensed steam and using again in the boilers. It is not expensive and gives good results and causes little or no trouble. It has been in operation over ten years, and the boilers are in good condition and show no signs of oil. In fact, the *oil does not get into the boilers.*

We have a wooden tank of 1,000 gallons capacity, into which we conduct all the condensed water from drying machines, circulation, calenders, etc., also exhaust steam from small engines

that drive the drying machines. Into this same tank we take the water from a Bulkley condenser on a 200 horse-power engine. This water from the hot-well flows into a 100-gallon tank which is placed just above the 1,000-galion tank and runs into the latter from the *bottom* of the small tank. The small tank has an overflow of 4 inches. The oil floats and passes off through this overflow while the clear water of 100 to 110 degrees flows from bottom to larger tank, where with the condensed steam and exhaust from small engines it is raised to boiling point. At bottom of this tank we connect boiler-feed pump to supply boilers. The 1,000-gallon tank also has an overflow which takes off any oil that may come from small engines.

We also have a connection with city water in the small tank controlled by cock and float-ball that will keep up the water level in case condenser water is stopped. The feed pumps are lower than tank so the water flows to it making easy and smooth work for pumps in handling this hot water which is about boiling point entering boilers.

Besides the benefit derived from the heat of the exhaust steam from small engines, we avoid the nuisance of exhausting over our roofs, which soon destroys the roof and any windows on wood work that may be near..

In the ten years or more that we have used this system we have had no trouble at all and always have a good supply of hot water that has no injurious effect on the boilers. If any of the members wish to see the system in operation and will call, we will be pleased to show it.

The PRESIDENT. If there is no further business, I declare this meeting adjourned without date.

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TRANSACTIONS

OF THE

New England

COTTON MANUFACTURERS' ASSOCIATION.

Organized July 25, 1865. Incorporated Dec. 1, 1894.

No. 59.

SEMI-ANNUAL MEETING.

(ATLANTA MEETING.)

HELD AT THE AUDITORIUM OF THE COTTON STATES AND INTERNATIONAL EXPOSITION, ATLANTA, GA., OCTOBER 24-25, 1895.

Office of the Association, 501 John Hancock Building, No. 178 Devonshire Street, Boston, Mass.

WALTHAM, MASS.:
PRESS OF E. L. BARRY.
1895.